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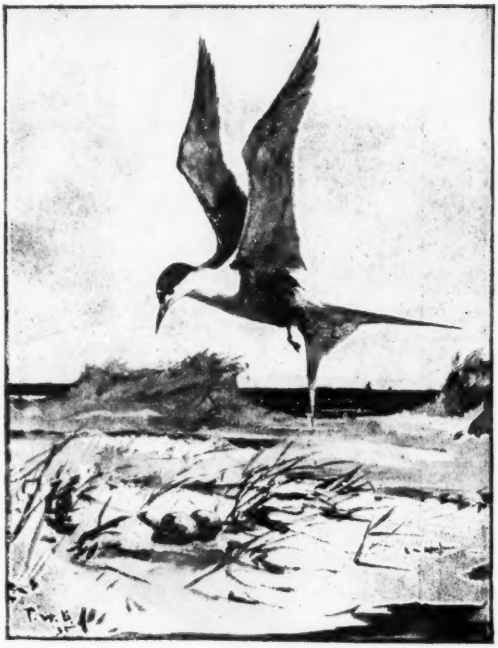

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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XIV OCTOBER 1943 NO. 4

COLOR-BANDED IMMATURE HERRING GULLS IN THE NEW YORK REGION

BY HUSTACE H. POOR

BRIEF HISTORY OF THE COLOR-BANDING PROJECT

IN 1937 Mr. Joseph J. Hickey suggested in *Bird-Banding* (Hickey, 1937) the merits of color-banding Herring Gulls (*Larus argentatus smithsonianus*) in a cooperative study by banders and field observers. It was hoped that observers, by reporting observations of color-banded birds to a central committee, would furnish data on migration, age of first breeding, return for breeding to natal colony or other colony, and changes in plumage and soft parts.

Response to Mr. Hickey's suggestion was immediate (Hickey and Allen, 1937), and a committee was formed comprising Dr. Alfred O. Gross (chairman), and Messrs. Richard J. Eaton and Benjamin Shreve to direct banding activities in New England. Dr. Harrison F. Lewis organized banding of gulls in Canada. The task of assembling and coordinating the records was undertaken by the Linnaean Society of New York, which supplied the first shipment of celluloid bands. The Fish and Wildlife Service kindly furnished the colored bands in subsequent seasons, as well as the aluminum bands with which each bird was marked.

During 1937, 1938, and 1939 a total of 21,561 juvenile Herring Gulls were banded at eleven colonies, as summarized in Table 2. Birds from each colony had a distinctive combination of colored celluloid bands on the legs, the combinations being different each year. Observations of bands on a guli thus fixed its natal colony and year of hatching. The combinations used are listed in *Bird-Banding* 10: 126 (1939), with the exception of the combination two black bands on one leg, used on 500 Kent Island juveniles banded in 1940, and not considered in this paper.

Colonies at which banding was undertaken are the following (see Fig. 1):

Wicopesset Island, New York—South of Stonington, Conn., close to the extreme eastern tip of Fishers Island, New York. Lat. 41° 18′ N., Long. 71° 55′ W.

Penikese Island, Mass.—One of the Elizabeth Islands bounding Buzzards Bay. Lat. 41° 27′ N., Long. 70° 55′ W.

Isles of Shoals, New Hampshire—Duck Island in the Isles of Shoals group, off

the coast of New Hampshire. Lat. 43° 00′ N., Long. 70° 36′ W.

Heron Islands, Maine—Off Cape Small, Maine. Lat. 43° 43′ N., Long. 69° 48′ W.

Muscongus Bay, Maine—A number of small islands in Muscongus Bay. Lat. 43° 52′ N., Long. 69° 23′ W.

Duck Islands, Maine—Great and Little Duck Islands ten miles south of Northeast Harbor, Mount Desert Island, Maine. Lat. 44° 10′ N., Long. 68° 15′ W.

Kent Island, New Brunswick—"One of a group known as Three Islands located in the Bay of Fundy about twelve miles southeast of Grand Manan . . ." (Gross, 1940) Lat. 44° 35′ N., Long. 66° 45′ W.

Bonaventure Island, Quebec—Eastern tip of the Gaspé Peninsula, near Percé. Lat. 48° 30′ N., Long. 64° 09′ W.

St. Mary Islands, Quebec—North shore of the Gulf of St. Lawrence. Lat. 50° 19′ N., Long. 59° 39′ W.

Razades Islands, Quebec—Two islands in the St. Lawrence River. Lat. 48° 12′ N. Long. 69° 08′ W.

Four Brothers Islands, New York—Four islands in Lake Champlain near Willsboro, New York. Lat. 44° 26′ N., Long. 73° 20′ W.

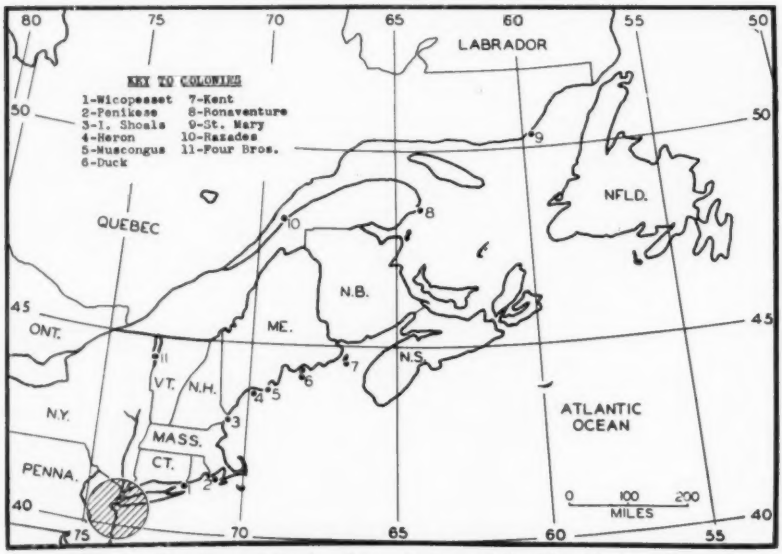

FIG. 1. Locations of the banding colonies and the New York region.

A similar color-banding project was initiated on the Pacific Coast in 1938. Its development is outlined in a succession of notes and articles in *News from the Bird-Banders*, starting in the May, 1937, issue. Summaries of the west-coast banding program and move-

ments of immature gulls are given by Sargent (1942a, 1942b 1942c).

TABLE I

RECORDS OF FIRST-YEAR BIRDS OF ALL COLONIES

(Records per 10,000 banded; all years taken together)

July	0	January	42
August	0	February	17
September	18	March	11
October	52	April	8
November	157	May	7
December	103	June	9

ACKNOWLEDGMENTS

It is impossible to acknowledge the assistance of all the collaborators who made the gull-banding project successful. However, there are certain persons whose outstanding contributions merit special mention.

Mr. C. L. Whittle, editor of *Bird-Banding* at the time this project was proposed, gave the program the enthusiastic backing which assured its initial success. Messrs. J. J. Hickey, R. P. Allen, and S. C. Harriot actively sponsored the program and maintained the records for the Linnaean Society. Particular thanks are due the banders, upon whose efforts the very existence of the project depended.

Finally, it is hoped that the many observers who provided the basic data for this report will find in it sufficient information of interest to repay their efforts.

SCOPE

The present paper is concerned with records of immature color-banded Herring Gulls in the region around New York, New York. The area considered is that included in a circle of 53 miles radius centered at Ambrose Lightship at the entrance to New York Harbor, Lat. 40° 27′ N., Long. 73° 49′ W. It embraces Long Island west of Bellport and the eastern end of Smithtown Bay, the Connecticut shore west of East Norwalk, the Hudson River south of Croton, and the New Jersey coast north of Barnegat Inlet.

All records from this region have been reviewed. Due to the scarcity of records of immature birds after January of their third winter, analyses are restricted to birds in approximately the first thirty months of their life. There are 1624 such records, nearly two-thirds of the total from the whole continent exclusive of juveniles dead on their breeding colony.

Reports based on preliminary data have previously been published (e.g., Hickey and Allen, 1938; Allen and Hickey, 1940). This

paper is the first based on complete data, and deals with seasonal changes in the Herring Gull population in the New York region. Other aspects of the project will be treated in subsequent articles.

RELIABILITY OF THE DATA

Factors of undeterminable magnitude affect the data upon which the analyses are based, reducing in number and impairing in accuracy the conclusions which are drawn.

Most observers are amateurs who can be afield only on Sundays and holidays. A series of rainy weekends in any one month would, therefore, reduce the number of records in that month.

General interest in the banded-gull project began to wane after a year or two, so that by 1941 only a few "die-hards" were still acutely band-conscious. This is illustrated by the fact that 1071 per 10,000 birds banded in 1937 were recorded, the number dropping to 882 per 10,000 for the 1938 birds and 374 for the 1939 birds. Comparisons of one year with another are, therefore, unsatisfactory.

As seasons change, there is variation in the locales chosen for "birding." In spring, the attention of observers is focused upon land-bird migrations. In winter, interest centers along the shore, and birding is sufficiently slack to invite such activities as looking for banded gulls. Also, because gulls are then most abundant and tame, rewards for such activity are greatest at this season, and band observation is stimulated.

Another variable is the habits of the gulls. In winter they frequent garbage dumps and piers (cf. Harriot, 1939); with the coming of spring, they withdraw to the outer beaches, where they are much less approachable. Also, young birds are disproportionately common at some of the places where observation is easiest.

Other factors affect comparisons of the abundance of birds of different ages. Mortality is one, the mortality rate being highest in the first year (Gross 1940). Another is the fact that the celluloid bands are not altogether permanent, and as time goes on an increasing number of birds have lost one or both bands. Hickey has pointed out (*in litt.*) that the durability of the bands varied from one shipment to another, being better in 1937 and 1938 than in 1939.

ANALYSES BASES

Records have been analyzed on a monthly basis. A month is a time interval small enough to give a good picture of seasonal distribution, yet large enough to include a statistically significant number of records.

It was found convenient to assume arbitrarily that all gulls were hatched on July first, and to compute ages from that date. Eaton

(1933), Gross (1940)*, and others have also used this assumption.

In treating "All Colonies," records from all eleven colonies are combined. Five colonies each yielding more than 160 records are referred to as the "major" colonies; the remaining six, each yielding fewer than 75 records, are referred to as the "minor" colonies.

Since different numbers of gulls were color-banded at the various colonies in different years, comparison of actual numbers of records without some adjustment is misleading. A comparison basis of "records per 10,000 birds banded" was selected. It is obtained by dividing the number of records by the number of birds banded in the classification considered (year of banding, colony, etc.) and multiplying the result by ten thousand.

Another comparison basis, useful for comparing one colony with another, is "percentage of normal expectancy." This is the ratio of records per 10,000 banded for a particular colony to records per 10,000 banded for all colonies taken together, expressed in per cent. It indicates the deviation of the number of records for an individual colony from the normal expectancy as indicated by the average of all colonies.

CONCLUSIONS—ALL COLONIES

Of the 21,561 juveniles banded in all three years, there is no record for the New York region in July of the year of banding.

Cruickshank (1942) states: "Migrants, the large majority immature, regularly arrive along our coast in late August." Griscom (1923) and Helmuth (1940) also place the beginning of fall migration through New York in August, although none of them specifically refers to first-year birds. There is but one August record of a color-banded first-year gull, and that is at the extreme end of the month, August 30th. The continued southward extension of the breeding range, which has now reached Long Island, may change this situation.

There are 37 records for September, the earliest September 3rd. Two-thirds of them are in the last half of the month. Numbers increase rapidly to a peak in November, drop sharply in December and January, then decrease more slowly to low values in the summer. Figures based on all three years taken together are presented on a birds-per-10,000-banded basis in Table I and Fig. 2. They confirm the results of censuses at the Fulton Fish Pier (Manhattan, N. Y.) by Harriot, who states (1939): "Perhaps the most interesting feature of our observations was the small number of first year banded gulls seen in January as compared with the relatively larger number seen in November . . . "

* All subsequent references to Eaton and Gross refer to these papers.

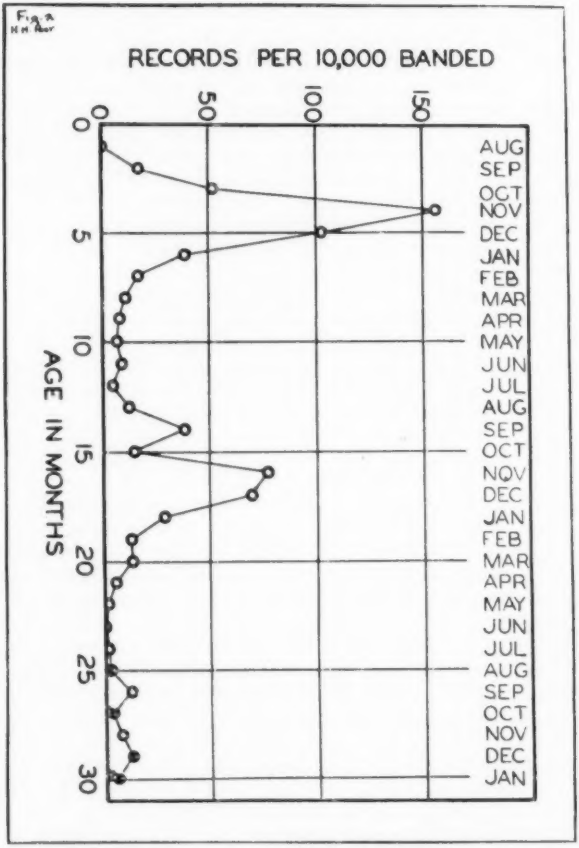

FIG. 2. New York region records per 10,000 gulls banded plotted against age of the birds.

As shown by Eaton and others, many first-year Herring Gulls winter along the Gulf Coast. It is not surprising, therefore, to find their numbers rising to a peak in the autumn and dropping off as the season advances.

The data show no corresponding resurgence in numbers in the spring. We may attribute some of the scarcity of spring records to

the shifting of popular birding interest from winter seacoast to inland land-bird flyway. Also, we may expect the spring migration to involve fewer birds, as winter mortality will have reduced the available stock of birds, and many survivors pass the summer south of New York. Helmuth (1940) noted a spring peak in late April and early May in his records from 1910 to 1920.

From a low point in July, the number of observations increases (with an unexplained drop in October) until the peak of second-winter birds is attained in November, with 77 birds per 10,000 banded. This figure is approximately half of the 157 per 10,000 recorded for first-year birds in their November maximum. Whether the fall peak of second-year birds represents entirely a southward movement of birds which passed north unobserved in spring, or partially a northward flight of birds summering farther south, remains unknown.

The numbers of second-winter birds remain high through December before falling off in January and February. Low values are reached in June and July.

Records of third-year birds merely substantiate the fact that the local population is greater in winter than in summer.

CONCLUSIONS—COMPARISON OF COLONIES

The 1624 records from the New York region are distributed among all eleven colonies. A tabular summary of these records on several different comparison bases is presented in Table 2.

As tabulated for each year, the first column, headed "Rec.", gives the actual number of records. The second, headed "Band," lists the number of birds banded at the particular colony. The third, headed "10^{-4}," gives records per 10,000 banded. The fourth, headed "%", lists the percentage of normal expectancy. In Table 2 the five major colonies are listed first and the six minor colonies next, the arrangement in each group being in the order of decreasing percentage of normal expectancy.

The numbers of records from the six minor colonies are insufficient to warrant inclusion in the discussion which follows:

A month-by-month comparison for first-year southbound major-colony migrants is presented in tabular form in Table 3, and graphically in Fig. 3. Coastal distances given are approximate. In measuring them it was arbitrarily assumed that Razades Islands birds crossed the isthmus at the base of Nova Scotia.

As might be expected, the first-year gulls which arrive earliest in autumn are those hatched at the colonies nearest New York, and in the early stages of migration birds from the nearest colonies are disproportionately common.

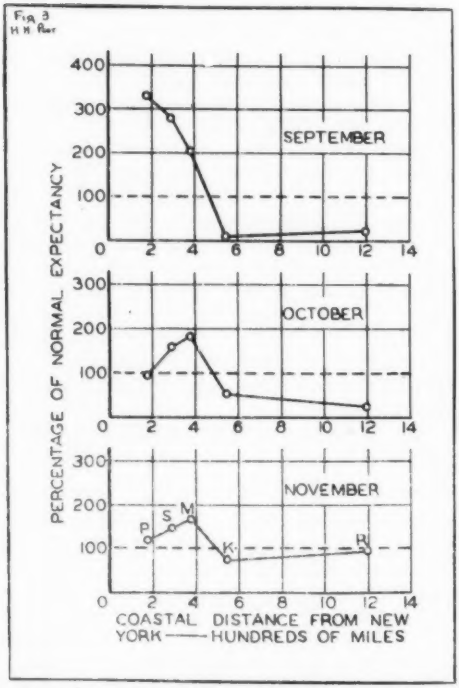

Fig 3. Percentage of normal expectancy plotted against distance of the banding colony from New York for the five major colonies. (P=Penikese, S=Isles of Shoals, M=Muscongus Bay, K=Kent, R=Razades.)

The only August first-year record is a bird from Penikese, nearest major colony, seen August 30th.

In September the highest percentage of normal expectancy is associated with Penikese, and the other colonies range downward in order of distance from New York, the sole exception being the Razades Islands. Since there are only two Kent Island records and one Razades record in September, their transposition in the sequence is not significant.

In October the percentage of normal expectancy for Penikese drops to average, and Isles of Shoals also drops, so that Muscongus Bay, although decreasing slightly, now leads. Kent Island moves up considerably, and the Razades Islands remain unchanged.

In November, Penikese Island rises a little, Isles of Shoals and Muscongus Bay drop, and Kent and Razades Islands gain. This trend continues in December.

MUSCONGUS

Muscongus Bay birds were banded on a number of small islands, chiefly Eastern Egg Rock, Western Egg Rock, and Old Hump Ledge, and secondarily on Jones' Garden, Wreck Island Ledge, Franklin Long Ledge, and others (Cruickshank, *in litt.*).

The 385 records of Muscongus gulls are almost one-quarter of the New York region total. Third-nearest of the major colonies, Muscongus ranks third in percentage of normal expectancy in September. As more birds arrive in October, Muscongus moves into first place, remaining there during November, then dropping slightly below Kent and Razades.

PENIKESE

Birds from Penikese, nearest of the major colonies, arrive earlier than any others. The only August record of a first-winter color-banded gull is a Penikese bird. Also, the earliest records in September are shown by Penikese, two birds on September 3rd.

In September, the first month of appreciable movement of first-winter gulls into the region, Penikese birds are more than three times as abundant as the average of all colonies. This preeminence is soon lost, the colony dropping to normal expectancy in October, November, and December.

ISLES OF SHOALS

The Isles of Shoals colony is second-nearest of the major colonies. Correspondingly, when migration through this region begins in September, Isles of Shoals gulls show the second-highest percentage of normal expectancy (282%), being exceeded only by Penikese.

Eaton considered 84 records from this colony. From seven records grouped in New Jersey around December 1st, he concluded that while most first-year gulls from this colony winter on the Gulf Coast, ". . . the Long Island-New Jersey region is a secondary *winter* range for the first-year birds from the Isles of Shoals colony." Eaton pointed out that concentration of human activity in this area could occasion such a grouping of records, but he discounted this cause since there was no evidence of such a grouping in 55 recoveries of Essex County, Massachusetts, gulls.

Color-banding records do not support in this respect the banding data available to Eaton. The New York region includes five of his seven records, thus appearing to be geographically satisfactory for testing his conclusion. There are 53 November records of Isles

of Shoals birds, 13 December records, 6 for January, and 3 for February. Comparison with all other colonies indicates 147% of normal expectancy in November, 55% in December, 67% in January, and 76% in February, indicating subnormal rather than hypernormal abundance of Isles of Shoals birds after the height of the migration season has passed.

RAZADES

Records of Razades Islands gulls are of particular interest. They show 93% of normal expectancy, thus refuting Eaton's contention relative to his "Laurentian Population":

> "Characterized by a breeding-distribution along the St. Lawrence River (lower Lake region?) to the Gulf of St. Lawrence (Labrador?). This population apparently possesses no habit of true migration to a southern wintering-ground during the first winter. The movements of immature and adult birds are indistinguishable, are highly localized, and are restricted to the general region of the breeding-range and the Maritime Provinces."

Although St. Mary birds (*q. v.*) show only one-fourth the expected number of records, it is evident that they do migrate south. The 161 Razades records, close to normal expectancy, indicate that Laurentian gulls are nearly as migratory as Atlantic coast colonies. Eaton's conclusion was logical, but the data available to him were misleading.

There are many records (a considerable proportion being birds found dead) of Razades gulls from eastern Quebec, Nova Scotia, New Brunswick, and most of the Atlantic and Gulf states. There are only a few upstream from the breeding colony, one at Ogdensburg, New York, being the sole record west of the international boundary. We may therefore conclude that Razades birds migrate northeast from the breeding colonies to the Gulf of St. Lawrence, thence southward along the Atlantic coast, and not westward to the Great Lakes and Mississippi basin, nor through the Lake Champlain and Hudson River valleys.

The only acceptable September record is September 24th, appreciable numbers of Razades gulls not appearing until October.

In view of the long route which must be traversed from the Razades to New York we would expect these gulls to pass through New York later than those from any other colony. They are later than most, but seem to follow a schedule close to that of Kent Island birds, as can be noted from the relations of Fig. 3, and the first-arrival dates of Table 3. It will also be noted that their peak comes in November, ahead of the Kent Island December peak. The young birds must therefore travel faster or leave the breeding ground earlier than Kent Island gulls.

According to Mr. R. Meredith of Quebec (*in litt.*) repeated visits to the Razades between June 4th and 7th have shown ". . . Herring Gulls hatching out in great numbers; in fact, the whole place looks about like an incubator, with the greater part of them either chipping the eggs, just out, or not hatched more than one or two days." It is his experience that optimum banding conditions obtain about July 4th.

Dr. Harrison F. Lewis states (*in litt.*) that on May 24th, 1936, laying at the Razades was "in full progress." On May 15th, 1932, laying on the nearby Biquette Islands had just begun. The first eggs on the Razades Islands hatched on or just before June 6th in 1931.

According to Gross, although eggs from the earliest nests on Kent Island in 1939 and 1940 hatched June 15th, " . . . nesting and egg laying does not reach its peak until well into June. A few young may be banded the last of June but at Kent Island mass banding cannot be carried on to an advantage until the middle, preferably the latter part, of July and August when the island is virtually alive with young."

Apparently the earliest Razades nests are about 10 days in advance of the earliest Kent Island nests, while the breeding activities of most of the Razades gulls precede those of Kent Island by several weeks.

KENT

On Kent Island, site of the Bowdoin Scientific Station, is the largest Herring Gull colony on the Atlantic coast. Intensive banding directed by Dr. A. O. Gross has yielded a wealth of information on the migratory habits of its gulls. (Gross, 1940.)

More than one-third of all color-banded gulls were marked at Kent Island and yielded one-third of the New York region records.

First-winter Kent Island gulls do not reach the region in appreciable numbers until October. There are only two September records, the earliest September 28th, compared with 23 records in October. This colony does not attain normal expectancy nor reach its peak until December, whereas other major colonies do so in November (*cf.* Table 3). Probably the lateness of Kent Island gulls is due to the distance of Kent Island from New York.

BONAVENTURE

The 100 gulls banded at Bonaventure in 1937 yielded 12 New York region records, 112% of the normal expectancy for 1937 birds. No peculiarities of this colony are disclosed.

HERON

The color-banding of 700 gulls on Heron Island in 1937 yielded 72 records, 96% of normal expectancy for 1937 birds.

WICOPESSET

Wicopesset is the "youngest" of the colonies, 21 nests found in June, 1933 by R. P. Allen (1933) being at that time the farthest south ever recorded on the Atlantic coast. By 1939 the colony had grown to about 750 pairs, and other breeding stations had been established on nearby Fishers Island and at several points on Long Island (McKeever, 1940).

There are 43 New York region records of Wicopesset gulls. Nearest of all colonies, Wicopesset is the only minor colony recorded in September.

DUCK

Thirty-three records of Duck Island gulls are available. Returns for 1938 birds show approximately normal expectancy, but for 1939 birds only half-normal. It is not known which condition is usual for this colony.

ST. MARY

As shown in Table 2, there are only one-fourth as many New York region records of gulls from the St. Mary colony as would be anticipated on the basis of records from the other colonies. Only the Four Brothers Islands show a lower percentage of normal expectancy.

Eaton's discussion of 31 recoveries of banded gulls from the "Saguenay County, Quebec, Colonies," a group of islands including St. Mary, showed 29 of these recoveries from Labrador to Nova Scotia, with two spring records from Georgia and Maryland. The low proportion of United States recoveries, and the complete lack of first-winter records anywhere between November 12th and March 8th led Eaton to the conclusion that movements of birds from St. Lawrence colonies were restricted to the Maritime Provinces.

Examination of records of color-banded St. Mary gulls reveals reports ranging from Massachusetts and Kentucky to Florida and Texas. Obviously St. Mary birds are not restricted to the Gulf of St. Lawrence region, although the low percentage of normal expectancy suggests that they may be considerably less migratory than most other colonies.

FOUR BROTHERS

The lowest percentage of normal expectancy is shown by the Four Brothers Islands, with only three records from the 253 birds banded.

TABLE 2

Colony	*1937*				*1938*				*1939*				*All Years*			
	Rec.	*Band.*	10^{-4}	%	*Rec.*	*Band.*	10^{-4}	%	*Rec.*	*Band.*	10^{-4}	%	*Rec.*	*Band.*	10^{-4}	%
Muscongus	107	683	1567	146	193	1491	1294	147	85	1512	562	150	385	3686	1044	139
Penikese	62	500	1240	116	78	500	1560	177	27	600	450	120	167	1600	1043	139
Isles of Shoals	47	500	940	88	85	788	1078	122	55	1000	550	147	187	2288	818	109
Razades	75	727	1031	96	69	800	863	98	17	780	218	58	161	2307	696	93
Kent	248	2250	1102	103	200	3059	654	74	93	2900	321	86	541	8209	659	88
Bonaventure	12	100	1200	112	...	0	...	...	...	0	...	...	12	100	1200	159
Heron	72	700	1028	96	...	0	...	...	...	0	...	...	72	700	1028	137
Wicopesset	14	75	1867	174	29	492	589	67	...	0	...	...	43	567	758	101
Duck	...	0	...	...	24	285	842	95	9	463	194	52	33	748	441	59
St. Mary	10	505	198	18	7	175	400	45	3	423	71	19	20	1103	181	24
Four Bros.	...	0	...	...	3	209	144	16	0	44	0	0	3	253	119	16
All Colonies	647	6040	1071	100	688	7799	882	100	289	7722	374	100	1624	21561	753	100

TABLE 3

	Penikese	*I. Shoals*	*Muscongus*	*Kent*	*Razades*
Distance—Air line	165 mi.	240 mi.	325 mi.	460 mi.	585 mi
Distance—Coastal	175 mi.	290 mi.	380 mi.	550 mi.	1200 mi.
First Arrival	Aug. 30	Sept. 8	Sept. 6	Sept. 28	Sept. 24
Avg. First Arrival	Sept. 13	Sept. 19	Sept. 13	Oct. 8	Oct. 8
Total Banded	1600	2288	3686	8209	2307

	Rec.	10^{-4}	%	*Rec.*	10^{-4}	%	*Rec.*	10^{-4}	%	*Rec.*	10^{-4}	%	*Rec.*	10^{-4}	%
September	9	56	329	11	48	282	13	35	206	2	2	12	1	4	23
October	8	50	96	19	83	160	35	95	183	23	28	54	3	13	75
November	30	187	119	53	231	147	98	266	169	98	120	76	35	152	97
December	14	88	85	13	57	55	44	119	115	105	128	124	29	126	122

TABLE 2. Summary of records of young birds (1 to 30 months old).
TABLE 3. Comparison of major colonies.

Since only one-sixth of the normal number of gulls appears in the New York region, it seems likely that the bulk of their migration is directed away from rather than toward New York. In this connection it may be noted that the three recoveries of Four Brothers gulls considered by Eaton are from Quebec.

The only other color-banded records away from Lake Champlain are a first-winter bird from Cape May, N. J., and a first-winter and a third-winter bird from Boston, Mass. These data are too few to determine the migration pattern of this colony.

SUMMARY

This paper discusses seasonal changes in the population of immature Herring Gulls in the New York region. It is based on 1624 records of color-banded gulls resulting from a program in which 21,561 Herring Gulls were color-banded at eleven breeding colonies in eastern North America. The following conclusions are reached:

(1) First-year Herring Gulls do not reach the New York region from the breeding grounds in appreciable numbers until September.
(2) In the early stages of migration (*i.e.*, September) gulls from colonies near New York are relatively more abundant than those from more distant colonies, the order of abundance being the same as the order of proximity to New York.
(3) In the later stages of migration the above situation no longer prevails.
(4) The local population of first-year Herring Gulls increases rapidly from the arrival of the first individuals in September to a peak in November, then rapidly decreases.
(5) The data fail to show any rise in numbers in spring.
(6) The existence of a secondary winter range in the New York region for first-winter Isles of Shoals gulls, as postulated by Eaton, is not substantiated.
(7) Gulls from the Razades Islands migrate northeast to the Gulf of St. Lawrence, then south along the Atlantic Coast.
(8) The breeding season on the Razades is earlier than on coastal colonies, the height of the nesting activities preceding that on Kent Island by several weeks.
(9) Eaton's hypothesis that "Laurentian" gulls are essentially non-migratory is incorrect.
(10) Kent Island gulls pass through New York somewhat later than those from other colonies, not appearing in appreciable numbers until October, and reaching their peak in December rather than in November.
(11) The majority of gulls from the Four Brothers Islands do not migrate through the New York region.

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THE 1941–42 SNOWY OWL INCURSION IN NEW YORK STATE

BY DAYTON STONER

WITHOUT doubt the invasion of the Snowy Owl (*Nyctea nyctea* (Linn.)) into New York State in the autumn and winter of 1941 and the immediately succeeding winter months of 1942 was one of the most extensive on record. My first notice of the probable impending movement of the species came through a newspaper cut and accompanying legend relating to a bird seen at Albany, New York, on October 30, 1941. Two days later a correspondent in eastern Massachusetts indicated that the species had appeared in that area. It then occurred to me that some detailed inquiry into the scope and distribution of the movement in New York State would be appropriate and profitable.

Accordingly, I first transmitted a considerable number of letters to both amateur and professional ornithologists in various parts of the state announcing the then current movement and asking for definite records of the bird's occurrence in their respective localities. Accompanying each letter was a typewritten sheet carrying a few simple questions relating to the prospective cooperator's records and observations of the Snowy Owl in his area. All this information was to be submitted by a specified "dead-line" date. Every one solicited made some response to the inquiry and all save one or two supplied one or more records.

On the occasion of past invasions of the Snowy Owl, particularly the heavy incursion which occurred in the winter of 1926–27, and the lesser one of 1930–31, considerable numbers of the birds were shot and submitted to taxidermists for mounting. In 1941 there were 166 taxidermists licensed by the New York State Conservation Department. Of these, 146 were solicited for records in this investigation. Despite the fact that 42 taxidermists did not reply to my inquiry and 32 others reported that they had received no specimens of Snowy Owl from this State for mounting, a large proportion of the 419 records announced in this article were obtained through the helpful cooperation of the 72 preparators who submitted information that was deemed sufficiently definite, accurate and convincing for consideration. The greatest number of Snowy Owls received by any taxidermist was reported by M. C. Huppuch of Buffalo, New York, who submitted 12 records for Erie county and 3 additional records for Niagara county.

Probably a much larger number of birds were shot than were

reported. Several correspondents indicated that gunners, after having shot an owl and more or less alleviated the urge to kill something, suddenly became fearful that their victim might be included in the list of protected species and forthwith left the body to decay without reporting it to any one. The owls often permitted close approach and made conspicuous targets for gunners when perched on a fence post, a haystack or a tree close to a dwelling.

Circumstantial evidence, as reported by W. C. Tilden, indicated that the death of one Snowy Owl in Ontario County was caused "by striking a high tension wire." (November).

Early in my inquiry the matter of possible duplication of records from certain localities presented itself. This was particularly true in the case of sight records. For example, one observer in the Long Island area reported 40 sight records in one day. A number of other observers in this area also reported single individuals or small numbers of Snowy Owls in the same section at about the same date. It seems reasonable to assume, therefore, that a considerable number of these reports must have involved the same birds. So, for this area and period, I have included only the 40 individuals noted by the single observer.

In this and every other instance where such duplication was suspected, a rigid check of dates, detailed localities, hour of day and other factors that might have a bearing upon the circumstances were taken into account and carefully evaluated. Moreover, in cases where the date, either exact or approximate, locality and name of observer or collector were not available the record was considered not suitable for this report. On these accounts, therefore, a considerable number of sight records, as well as some specimens reported to have been collected, have been eliminated from consideration. If error has been committed it is definitely on the side of conservatism.

All of the records which I obtained were transmitted to a representative of the "Snowy Owl Committee," a group of ten ornithologists which conducted a survey of the invasion for Eastern United States and Canada. In due time the report of this Committee, of which I was a member, was published. (Wilson Bull., 55 (1): 8-10, 1943.)

Extent of the Invasion in New York State

The southward movement of Snowy Owls in the invasion of 1941–42 evidently followed the major water courses and coast line of the State. As the movement came to a climax the birds continued to congregate along streams and bodies of fresh and salt water. On the basis of the 419 records available for this report, the points of greatest concentration appeared to be along the Hudson, Mohawk

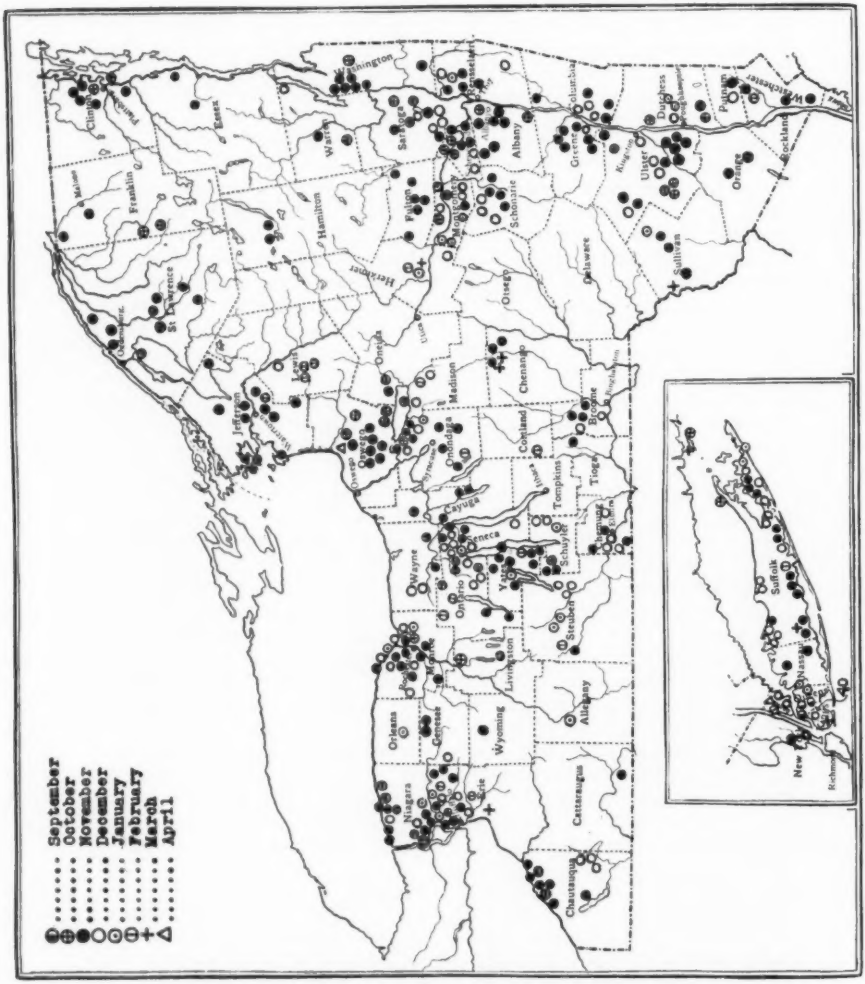

FIG. 1. Outline map of New York State showing approximate locality for each of the 419 Snowy Owl records announced in this report. No distinction is made between the 128 sight records and the 291 records of birds killed or captured. Invasion of 1941–42.

and Niagara rivers, Long Island Sound, in the Oneida Lake and Finger Lakes area, the Rochester and Watertown areas on Lake Ontario and the Buffalo and Dunkirk areas on Lake Erie. Probably this concentration occurred at these points principally on account of the food supply available there in the way of dead fish, ducks, rats and other animal forms both dead and alive. Lesser converging points were to be found along water courses and about the smaller lakes in non-mountainous territory.

The Adirondack, Catskill and Allegany sections of the State were poorly or not at all represented by records. Since the Snowy Owl obviously prefers flat, open situations, it is not surprising to find that the bird was seldom reported for the rougher, more wooded portions of the State.

Seasonal Distribution

Records of the presence of the Snowy Owl in New York State were received for every month from September, 1941 to April, 1942. Strangely enough the three September records are for Queens County, near the southernmost part of the State. These Long Island records, and the next earliest seasonal record—October 14, at Oneida Lake, one bird killed—provide at least circumstantial evidence for the belief that the first birds arrived in the State *via* the coastal route while the invaders which followed the Great Lakes and Hudson River flyways arrived a little later. Most of my records for the period October 15 to 31 are from up-state New York.

As in the 1926–27 and 1930–31 movements reported by Gross (*Auk*, 44, No. 4: 479–493, 1927 and *ibid.*, 48, No. 3: 501–511, 1931) the maximum abundance of Snowy Owls in 1941–42 occurred in November.

Apparently a gradual increase in numbers occurred until late November or early December. The actual southerly movement seemed to cease then. Following this, in most places, the numbers of the bird declined through shooting or fluctuated through local incursions or excursions. By January 1, 1942, this reduction in numbers had become obvious. This was brought out strikingly in the responses which were elicited from twenty of the taxidermists whom I had solicited earlier in the season when each had furnished two or more records. Very few specimens were brought to them for mounting after mid-January. The January reduction in numbers became accelerated in February and March so that by early April the birds were seldom recorded.

The following tabular summary will illustrate this point and other matters to be discussed later regarding the seasonal occurrence and abundance of the Snowy Owl in the State. By way of comparison

it will be noted that the records of the occurrence of birds by months follows fairly closely the situation which prevailed in the 1930–31 invasions as outlined by Gross (*loc. cit.*). One slight departure is seen in the evidently earlier mass seasonal movement in October, 1941.

TABLE I

DETAILED SUMMARY SHOWING SEASONAL DISTRIBUTION OF SNOWY OWL RECORDS FOR NEW YORK STATE: INVASION OF 1941–42

Number of records included in this report	419
Number of collecting records (birds killed or captured)	291
Number of sight records	128
Earliest record (sight)	September 28, 1941
Height of movement	November, 1941
Latest record of bird collected	April 3, 1942
Latest record of bird seen	April 5, 1942
Status of records by months—	
September (sight records only)	3
October (39 collected; 8 sight records)	47
November (169 collected; 24 sight records)	193
December (60 collected; 62 sight records)	122
January (15 collected; 12 sight records)	27
February (5 collected; 12 sight records)	17
March (2 collected; 6 sight records)	8
April (1 collected; 1 sight record)	2

It will be noted from the preceding table that, during the first four months of 1942, the only spring months for which Snowy Owl records were reported, both sight and collecting records together amounted to only 54, considerably less than one-half the number of records available for the single preceding month of December, 1941. Probably their marked falling off was due in part to destruction of the birds by gunners in November and December as well as to the reduced number of hunters during the first three months of 1942 and, in March and April, to the withdrawal to the north of surviving owls. It is interesting to observe in this connection that the two latest spring records were for birds, one well to the northern part of the State the other well toward the southern part, with a straight-line diagonal distance between them of approximately 250 miles. One of the owls may have been following the inland lake route north, while the other, had it survived, might well have returned by the coastal route.

My latest spring record for a Snowy Owl collected in the State is that of a male captured on April 3, 1942 on a farm about two miles from Mexico in Oswego county. Although the stomach was empty the bird was fat and in good flesh as well as in excellent plumage. It measured 22⅜ inches in length and weighed 3 pounds, 12 ounces. Contrary to the condition which prevailed in so many of the freshly killed specimens of Snowy Owls which I examined, this bird har-

bored no bird lice (Mallophaga). The owl was mounted by Arthur Paladin, Sr., recently retired Technical Assistant in Taxidermy in the New York State Museum, and is now in his collection.

The Snowy Owl reported by David Kemp as seen by him at Clason Point, Bronx County, Long Island, on April 5, 1942 is the latest spring sight record received.

The record for the greatest number of Snowy Owls noted by any one observer easily goes to Mr. George Compton, a taxidermist in Brooklyn, New York. In his response to my questionnaire he submitted a number of records for birds shot and viewed alive in the field, writing in part:

"I am a member of the Brookline Bird Club and have counted forty, yes forty, snowy owls in Canarsie marsh land [Jamaica Bay, Long Island]. This is the most I had seen in 15 years as an observer. This count was made on the afternoon of December 31, 1941."

In an effort to further substantiate this unusual observation and to obtain more details concerning it as well as to question the possibility that some of the owls seen may have been duplicates, I wrote to Mr. Compton asking certain very specific questions.

In reply Mr. Compton enclosed a marked map showing the scene of his observations concerning which he wrote further as follows:

"No, I could not have counted them twice as I could look over the beach for miles from where I was standing on the Belt Parkway bridge. I counted these forty owls in twenty minutes' time and recounted them several times. . . . The owls were from 300 to 600 feet apart. . . . Some of the owls were 50 to 100 feet from the beach while others were actually on the beach."

The above details, together with other matter scattered through Mr. Compton's correspondence, leave little room to doubt the authenticity and accuracy of his statements regarding this remarkable assemblage of Snowy Owls.

Types of Territory and Habitat Occupied

As previously indicated, the principal lines of southerly movement of the Snowy Owl appeared to follow lake and ocean beaches as well as major inland lakes and streams. And, while numbers of the owls continued to inhabit such situations, some of the birds moved into rural districts usually not too far removed from the vicinity of water.

One of the factors contributing to the high mortality of Snowy Owls from gunners was their habit of frequenting the main highways or open fields adjacent to them. A considerable number were shot in such situations. In several reported instances owls were captured alive. Concerning their lack of fear, Dr. Harry C. York of Elmira, Chemung County, writes that one man "got within about 30 feet" of one of the [two] owls before it took flight. Another observer reports that after getting out of his car he walked toward

the bird which permitted him to approach "within a few yards" of it before taking flight.

Further detailed data which throw some light upon the favorite haunts of Snowy Owls and the type of territory frequented by them in their 1941–42 invasion of New York State are available from various sources. Excerpts from letters of correspondents and annotations made by observers on the inquiry blanks provide numerous original remarks dealing with this subject. A number of these records have been assembled in the following table wherein the matter is arranged chronologically with respect to the period covered.

TABLE II

TYPES OF HABITAT OCCUPIED BY SNOWY OWLS IN NEW YORK: INVASION OF 1941–42

Date 1941	*Locality*	*Reported by*	*Type of Habitat*
October			
25	Essex Co.	Geo. Cantin	"Swamp land along Lake Champlain."
	Albany Co.	J. Diesseroth	"One bird seen sitting on a woodpile in a back yard" at the north end of the village of Ravena.
30	Albany Co.	D. Stoner	The first individual reported from Albany was photographed on the top of the chimney of a dwelling in flat, open territory at the outskirts of the city.
November			
1	Clinton Co.	G. R. LaPlante	[One shot on] "rail fence in open field." . . . "A number" of excited crows attacking the owl.
7	Albany Co.	D. Stoner	Taken in grain elevator at Port of Albany.
14	Chautauqua Co.	O. M. Culver	"Killed in apple orchard near house within 3 miles of Lake Erie."
16	Yates Co.	V. Burtch	"Saw my first Snowy Owl. It sat on a Muskrat house on the shore of Keuka Lake for more than three hours."
17	Genesee Co.	A. Keller	"Shot in man's chicken pen."
18	Saratoga Co.	C. Brackett	Owl killed in "open hardwoods with patches of evergreens."
	Chenango Co.	C. Brownell	♂ shot; "taken at chicken ranch."
	Genesee Co.	A. Keller	"Shot in open field."
19	Tioga Co.	B. J. Livermore	"Bird [shot from] haystack."
27	Franklin Co.	Mrs. V. Haskins	The bird was "shot for killing chickens in the farmyard"; tried several times before getting him.

Date	*Locality*	*Reported by*	*Type of Habitat*
29	Albany Co.	E. Geiser	Bird sitting "on rock on small bushy island in Hudson River"; 3:00 p. m.
	Albany Co.	Mrs. I. Snyder	Evening: "Large white bird perched for a few minutes on an elm tree in an open field near the farmhouse."
December			
3	Genesee Co.	A. Keller	"Shot in Tonawanda Swamp."
14	Chautauqua Co.	V. Sawkins	Submits five records of birds killed between November 27 and December 14. "In this locality these birds seem to stay around the lake [Erie] front."
21	Ontario and Seneca Cos.	C. Vance	Submits eight records of birds killed between October 30 and December 21. All "taken in open country pasture lots, etc."
31	Schuyler Co.	J. K. Terres	"In all localities where I have seen Snowy Owls, they occurred in flat upland valleys in which broad fields were divided by hedgerows . . . "
	Suffolk Co.	E. Wilenski	"Shot in a tree on the beach."
	Warren Co.	Mrs. R. Carpenter	"The owl was sitting on the top of a pile of waste from the abandoned Lake Shore Graphite Mine."
1942			
January			
18	Ontario Co.	H. Duncan	"Shot in open, hilly pasture."
20	Oneida Lake	P. J. Nickerson	Submits 11 records of birds killed. "The shores of Oneida Lake seem to have been the best locale for these specimens."
31	Seneca Lake	T. T. Odell	Submits four records from Seneca Lake and one from Keuka Lake.
February			
2	Lewis Co.	J. B. Belknap	"The birds stay in the narrow wooded valleys which are numerous in the Tug Hill section."
March			
10	Montgomery Co.	G. H. Lesser	Records for 14 owls killed. "Most were shot in close proximity to homes and barns."
23	Long Island	G. Gill	Bird shot on open beach; "pestered by Crows when first seen."

SEX RATIO

Among the 291 Snowy Owls indicated in this report as having been collected, the sex of only 87 individuals was reported or is definitely known. Of these, 48 are males, 39 are females. These figures suggest a slight preponderance of males over females in the ranks of the invaders, but the records are too meager to permit complete acceptance of these proportions between the sexes for the movement as a whole or even as it was exhibited in New York State.

WEIGHTS OF SNOWY OWLS

During the course of this investigation a considerable number of weights of collected birds were received. Some of these obviously were little more than guesses or estimates. Others were not satisfactory for one reason or another. However, twenty of these weight records are or appear to be sufficiently trustworthy to warrant publication and are set forth in the following table. It will be noted that considerable variation in weight exists between the lightest male, weight 1 pound, 9 ounces and the heaviest female with a reported weight of 5 pounds, 4 ounces. In the table the birds are arranged chronologically in the order of their taking.

DISEASES AND PARASITES

Of the seven specimens of Snowy Owl which I examined in the flesh, all save one appeared to be in a healthy condition. While varying degrees of emaciation or well-being were exhibited, in no case was the empty stomach or ill-fed condition of such long standing as to have caused death.

The single diseased specimen, a male, captured alive on a farm near South Cambridge, Washington County, November 15, 1941 was kept in captivity until its death on December 5. During this period the owl accepted no food.

Gross examination of the interior of the body of this owl revealed that the lungs, heart, liver, peritoneum and other organs were closely and heavily marked with round, whitish areas or nodules varying in diameter from 1 to 5 mm. Microscopic study of this material indicated that the bird was suffering from an aspergillotic infection, a fungus disease which may have been at least partly responsible for its demise. A detailed account of this case prepared by Dr. Gordon M. Meade of the Strong Memorial Hospital staff, Rochester, New York, and the writer, appeared in the October, 1942 number of *The Auk* (pages 577–578; 1 plate).

Abram Smith, a taxidermist in Kerhonkson, Ulster County, New York reports that on December 5, 1941, a Snowy Owl was brought to him by a resident of the nearby village of Accord. This bird was

TABLE III

SUMMARY OF WEIGHTS OF TWENTY SNOWY OWLS COLLECTED IN NEW YORK STATE BETWEEN OCTOBER 21, 1941 AND APRIL 3, 1942

Date	*Sex*	*Weight*	*County*	*Reported by*	*Remarks*
1942		*lbs. oz.*			
October					
21	♂	1 9	Saratoga	J. Bruchac	"Very thin." Chasing ducks when shot.
22	♂	3 8	Ontario	W. C. Tilden	Stomach "contained remains of common field mice."
27	♀	1 12	Saratoga	J. Bruchac	"Very thin."
..	♀ (?)	2 8	Monroe	P. Kondolf	"Stomach empty."
November					
14	♀	1 14	Saratoga	J. Bruchac	"Very thin."
14	♂	2 8	Madison(?)	W. A. Dence	Shot at Oneida Lake.
15	♂	2 3	Washington	D. Stoner	Died in captivity; aspergillotic.
16	..	3 6	Yates	T. T. Odell	Reported weight 155.3 grams.
17	♂	4 0	Albany	D. Stoner	Fine plumage and physical condition.
19	♂	2 10	Schoharie	D. Stoner	Good condition.
20	♂(?)	3 4	Monroe	P. Kondolf	"Stomach contained a half grown Rhode Island chicken weighing 7 oz."
24	..	4 6	Stueben	B. Riopelle	
25	♀	3 5	Albany	D. Stoner	In good flesh.
28	♂	3 8	Suffolk	G. Compton	
28	♀	5 4	Suffolk	G. Compton	
..	..	2 8	Monroe	P. Kondolf	"Stomach empty."
December					
5	♀	3 7½	Essex	D. Stoner	Not in good flesh: Stomach empty.
5	♂	2 9	Saratoga	J. Bruchac	"Very fat."
10	♂	3 12	Rensselaer	D. Stoner	Stomach full; feathers, flesh and bones of scaup duck.
1942					
April					
3	♂	3 12	Oswego	D. Stoner	Fat; in good condition; Stomach empty.

apparently hurt or sick and eventually died. The available information regarding the owl's condition and lethargic behavior suggest that it, too, may have been suffering from aspergillotic infection similar to that of the individual from Washington County.

Although I received only one report of the presence of external parasites on the Snowy Owls examined by others, six of the seven birds which I was privileged to inspect in the flesh carried greater or less numbers of biting lice or bird lice (Mallophaga: Philpoteridae). Samples of these parasites collected from different owls were submitted for determination to Dr. J. Bequaert of the Schools of Medicine and Public Health at Harvard University and to Dr. H. E. Ewing of the U. S. Bureau of Entomology and Plant Quarantine. In both instances the lice were determined as *Eustrigiphilus ceblebrachys* (Nitzch). Dr. Ewing reports that "it is a very common species on the Snowy Owl."

One of the owls in particular was very heavily infested with these Mallophaga in various stages of development. This bird was taken November 17, 1941 in West Albany. In the young condition the lice are minute and white or whitish in color. The adults average about 2.5 mm. in length and are dark horn color or blackish. It is interesting to note that the aspergillotic owl mentioned above also was very heavily infested with these Mallophagans. However, I doubt whether either their presence or abundance was in any way responsible for the bird's weakened condition.

The only Snowy Owl which I examined and which was not infested with Mallophaga was collected near Mexico, Oswego County on April 3, 1942. While the stomach of the bird was empty, the body carried much fat and the plumage was in excellent condition. I am at a loss to explain the complete absence of the parasites on this individual as compared with the high degree of infestation of the other six birds, five of which were taken in Albany, or within thirty-five miles of that city. One of the six was collected near Ticonderoga, Essex County.

Concerning a male Snowy Owl shot near Orient, Suffolk County, Long Island on October 31, 1941, Roy Latham reports that the "bird carried many Mallophaga."

CONCLUSIONS

The Snowy Owl invasion of 1941–42 was the largest since 1930–31. Its occurrence coincides with expectation based on some investigators' theories of such phenomena with respect to the eleven-year sunspot cycle in relation to rainfall, annual tree growth and abundance of certain animal species.

Unfortunately, it appears from the information gathered, that the

Snowy Owls which participated in this invasion fared no better at the hands of gunners than did those of earlier invasions such as those of 1926–27 and 1930–31. In fact so large a number of the birds were shot that from the standpoint of survival it were better that they had taken their chances on a reduced food supply in their normal home than to have faced the barrage of shot from hunters' guns to which they were subjected in the invaded territory.

Of necessity, in an inquiry of this type, cooperation must be had from numerous individuals and agencies. In addition to the persons definitely mentioned in this report, my thanks and obligation are acknowledged to a large number of correspondents and collaborators without whose response the investigation would have been impossible of accomplishment.

New York State Museum, Albany, New York.

A FUNGUS INFECTION OF THE LUNGS AND AIR SACS OF A COMMON MALLARD

By C. Courson Zeliff

Infection of the lungs, air sacs and even other organs of domesticated birds by the fungus or mold *Aspergillus* is not uncommon. "Brooder pneumonia" is the name applied to the disease by poultrymen when the air passages are involved. The scientific name for the disease is aspergillosis. The endings "iasis" or "osis" are frequently affixed to the scientific or generic name of an organism to designate the disease caused by it. There are numerous species or kinds of this fungus, some do not produce disease, for example one may be found on moldy bread, along with other molds. *Aspergillus fumigatus* is the complete scientific name for the species causing "brooder pneumonia" or aspergillosis in many kinds of birds. The common name indicates that young birds frequently have the disease but it may occur in mature birds as well.

This fungus or mold is said to exist in straw, dusty grain and other organic matter, from which it may invade weakened or undernourished birds. A scientific name applied in a broad way to infections by fungi or molds, as they are commonly known, is mycoses (singular mycosis). Many fungi (singular fungus) attack animals, both wild and domesticated, and also man. Some cause athlete's foot and ringworm, which are well known. The latter name is misleading since there is nothing worm-like connected with the disease. It is because of the inaccuracy and confusion in use of

common names for organisms and diseases in various localities, that the more uniform scientific term or name of world wide uniformity is the choice of scientists. The scientific terms are chosen largely from Greek or Latin and mean nearly the same thing. For example "mycosis" is partly from the Greek word "mykes," which means fungus.

A dead female common mallard (*Anas platyrhynchos*) was recovered from the College Pond at State College recently by Dr. P. F. English, Associate Professor of Wildlife. An autopsy of the bird by Assistant Professor Merrill Wood, an ornithologist, revealed yellowish white nodules or masses in the lungs and air sacs of the abdomen. These cheesy nodules (Fig. 1.), varying from an eighth to three-quarters of an inch in diameter and concentric in pattern were sent to the writer for examination. It was suggested that some parasite, possibly an immature stage of a worm was enclosed in each. Unfortunately the writer did not see the entire internal organs of the bird or obtain a photograph of them. Gordon and Stoner (1942) give illustrations of the infected liver and stomach of a Snowy Owl having aspergillosis.

Diagnosis of aspergillosis can only be accurately made by securing some of the mold or fungus from the tissue of an infected animal. The usual technique is to add a drop of 10–30% potassium or sodium hydroxide to a mount of the tissue, which results in clear cut or transparent specimens. This is done by pressing a small amount of the tissue between a microscopic slide and cover glass. Water, alcohol or formalin may be used as substitutes but equal transparency will not be obtained. Sectioning of a nodule for finer details is worth while but was not carried out in this case since a microtome for slicing was not at hand. Culturing or growing the fungus as is done for bacteria would also aid in accurately identifying the species. Special equipment and living material rather than preserved, as was sent the writer, are also necessary for such technique. Since such technique has been completed for this fungus in research investigations and also because too many scientific terms are involved in the complete discussion of the disease or pathology (Fox, 1923) the writer feels that complete details are well omitted here.

A portion of one of the tubercles as examined under the microscope (Fig. 2) reveals it as consisting in part of tissue of the bird and an interwoven mass of filaments or hyphae of a mold or fungus. A mass of these hyphae constitute a mycelium or the body of the fungus. The hyphae can be seen projecting from the edge of the mount. The dark, spherical structures in the mycelium or mass are one type of reproductive structure of the fungus. Along the edge these appear as stems, having a spherical tip and brush-like

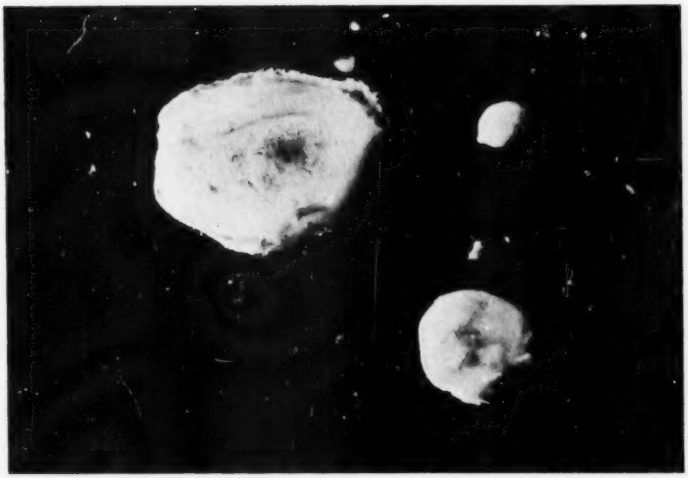

FIG. 1. Photograph of three tubercles or nodules from the lungs and air sacs (X 7.)

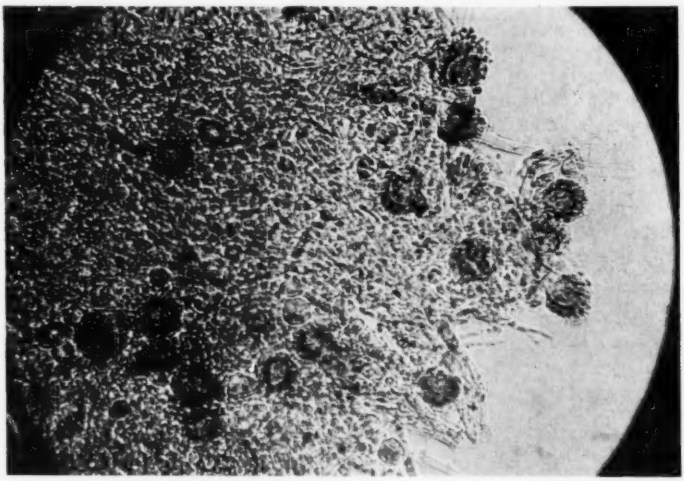

FIG. 2. Photomicrograph of a compressed portion of a nodule showing mycellium and reproductive structures of the fungus. (X 375.)

border. The brush-like portion consists largely of spores which disseminate the fungus and cause the infection of new hosts or animals. The shape of the "head," as it is sometimes called, is characteristic for the fungus, *Aspergillus*.

A complete description of the symptoms of the disease and its effect on the organs will be omitted because of the technical terms involved. Internally, as previously stated, an invasion of the lungs, air sacs and other organs may occur. Enzymes are secreted which cause disintegration or digestion of the tissues attacked. In aspergillosis the lungs of a bird are said to be more diseased than in tuberculosis. The nodules look much like those found in the latter disease but a mycelium is not found in the former.

Among the external sysmptoms are a foul odor in advanced stages of the disease, a loss of weight or "going light" an expression used by many poultrymen. The mallard with this disease is smaller and lighter in weight than normal. An infected bird breathes with difficulty, sneezes, gasps for breath and later dies. The mortality rate may reach 90% in domestic flocks. Further details are given by the authors listed in the references at the end of this article.

Captive birds, in zoological gardens, often become infected. Water birds are more susceptible. Aspergillosis in wild birds not in captivity seems to have been given very limited study. The Snowy Owl autopsied or examined by Gordon and Stoner was kept in captivity some time before its diseased condition was observed and hence the disease may have been caused by contaminated food eaten after its capture. Possibly more cases of aspergillosis occur in wild birds than is suspected.

Aspergillosis may also occur in man. In India the fungus grows in the external ear. Possibly the mycoses of the external ears of individuals who have been bathing in the waters about the Solomon Islands may be due to this fungus. Reports of this have occurred in recent publications.

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GENERAL NOTES

Black-crowned Night Herons Feeding on Water.—In ornithological literature, mention is occasionally made of Night Herons alighting on the water. This appears to be a rare occurrence, however, and thus the following is of some interest.

On the evening of June 6th, 1943, I was driving along the shore of Crystal Lake, Newton, Mass., about 8:15 and saw a sizable bird alight on its surface. This lake is used for public bathing and has considerable depth. Daylight was fading and the sky overcast so I could not at once make an accurate identification. After stopping the car the bird arose from the water and I observed it to be a female or immature Night Heron. A male joined the first bird, and they both circled about but after once dropping to the surface of the lake the male flew to a tree where it remained while I was there. Its companion continued on the wing, and I saw it drop into the water seven times but never going beneath the surface. Apparently the bird secured food; once it rose with something in its bill, and after feeding continued to circle over the lake. The constant coursing over the water was also unusual but the heron wheeled and dipped with ease and moved much like a Herring Gull in the air and on the water. When nearing the surface it extended its long legs straight down as it does when alighting on the ground or in a tree. At the end of fifteen minutes, the bird left the vicinity.—CHARLES B. FLOYD, Auburndale, Mass.

A Marked Migration Wave During the 1943 Spring Season.—The wave-like appearance and disappearance of birds during the migration season is well known. One of the most striking examples of a "tidal-wave" I have ever witnessed occurred at Mayville, North Dakota on April 9, 1943. The species under observation was the Slate-colored Junco, *Junco hyemalis hyemalis* (Linn.).

Examination of graphs of daily banding for the junco indicates that for the past three years a wave of junco migration has occurred on about this date, but has extended over a three or four day period. Below is a tabulation of the six day banding records for these waves. It appears that all of the movement spread over the three or four day period in other years occurred in one day this year.

TABULATION OF JUNCO BANDING DURING A SIX DAY PERIOD IN 1941, 1942 AND 1943

Date	*Year* 1941	1942	1943
April 5	3	–	6
6	35	52	11
7	No banding	60	11
8	32	60	11
9	34	26	102
10	4	1	6

One hundred and two juncos were banded on April 9, 1943, eleven on the day preceding and six on the day following. Almost one-third of the juncos banded during the entire migration period were banded on this one day. One hundred thirty-one were banded in the eleven days preceding and one hundred eighteen in the twenty-one days following. In 1941 and 1942 this wave also accounted for approximately one-third of all juncos banded.

SUMMARY OF TRAPPING RECORDS FOR JUNCOS DURING FIRST TWENTY DAYS OF 1943 SPRING SEASON

Date	Number Banded	Number of Repeat Records on a Date with the Date when the Birds were Originally Banded.
March 29	3	
30	14	
31	9	2—3/30/43
April 1	22	1—3/31/43
2	14	
3	23	1—4/ 1/43; 3—4/ 2/43
4	7	1—4/ 2/43; 2—4/ 3/43
5	6	1—4/ 1/43
6	11	1—4/ 2/43; 1—4/ 3/43; 1—4/ 5/43
7	11	1—4/ 6/43
8	11	1—4/ 6/43
9	102	
10	6	1—4/ 9/43
11	28	1—4/ 9/43; 1—4/10/43
12	8	1—4/10/43; 6—4/11/43
13	3	2—4/10/43; 2—4/11/43; 6—4/12/43
14	–	1—4/11/43; 1—4/13/43
15	6	2—4/12/32; 2—4/13/43
16	4	2—4/11/43; 3—4/12/43; 1—4/13/43
17	–	2—4/11/43; 2—4/12/ 3; 1—4/16/43

NOTE: Repeat records made on the day of banding not entered: a single bird may have repeated more than once on a given date, or on successive days.

The above summary of trapping records emphasizes the abruptness and magnitude of this migration wave. It also serves to indicate the nature of the movement when the repeat records are examined. Before April 9, about one in ten of the birds banded remained around the station and was caught at least one day later, while only two of the 102 birds banded on the ninth repeated at a later date. For the period following April 9, about one in three of the birds repeated at least one day later. A total of 115 repeat records was made for the season, only five of them involving the 102 birds banded April 9. These records seem to indicate that previous to April 9, juncos came into the area in small numbers and may have stayed around for several days. They all moved on April 9, so that no more repeats of birds banded before that date occurred. After that date the birds again moved in small groups and stayed in one place for some time. On April 9, the juncos came and left in rapid succession.

These trapping records are supported by field observations. When it appeared that an unusually large number of birds were about the traps in the early morning I decided to use them for laboratory study by the biology class at the State Teachers College. This class spent the hour from ten to eleven o'clock at the station watching the birds through the windows and observing banding operations. Incidentally, rank novices unbelievingly caught their first birds with a drop trap! This procedure was also used by the nature study class between two and three o'clock. About eight hours were spent in rather close observation at the station. Several students spent extra time at the station during the day.

It was apparent from our observations that a flight of birds came in from the south-east and stopped to feed or rest. The automatic traps would fill and we would discuss whether to take two or three or wait to take four at once under the drop trap. When we went out to empty the traps the rest of the flock would leave

in a north-westerly direction. In about five to fifteen minutes the process would be repeated with another group coming in from the south-east. The rate of capture was approximately constant throughout the day without the morning and afternoon peaks common to trapping operations.

Probably not more than one in fifteen of the birds to alight in the trapping area was caught. If this estimate approximates the true situation it would mean that during the day about 1,500 birds crossed the trapping area which is about fifty yards wide. If the movements were nearly uniform over the Mayville region, and observations on other parts of the college campus and in other parts of town lead me to believe that we did not have any particular concentration of birds on the trapping area, then across a ten-mile strip about 500,000 birds moved northward on this one day! Assuming a like movement for the general region about three million juncos moved up the sixty mile wide Red River Valley of the North on this one day.—HAROLD C. BURDICK, State Teachers College, Mayville, North Dakota.

Crippled Birds.—The notes by Ralph W. Dexter in the July 1942 issue of BIRD-BANDING set me looking through my banding journal for records of injured birds. The following entries were for injuries not incident to banding which had healed or were definitely healing at the time of observation.

No. 140-25375 banded July 17, 1940; adult Bank Swallow with infection in eye which had destroyed the eyeball, feathers of the eyelids and area at the corner of the eye. The infection was discharging at the time of observation.

No. 40-157125 banded Oct. 7, 1940; adult White-throated Sparrow with left tarsus broken about in the middle, healed and set at a slight angle.

No. 41-82437 banded July 10, 1941; adult Bank Swallow with one eye infected, similar to No. 140-25375 but not as extensive when observed.

No. 40-157443 banded Oct. 10, 1941; Harris's Sparrow with tarsus completely broken off about 2/3 distance from proximal end, foot dangling by the tendon. The stump had healed over the end of the tarsus with a slight swelling; there was a small opening just large enough to let the tendon slip back and forth when the muscles of the leg contracted. I clipped the tendon close to the stump and it retracted through the opening. There was no indication of infection.

No. 42-23766 banded April 27, 1943; adult Slate-colored Junco with the hind toe of the left foot injured so that it did not open; the bird rested on the back side of the base of the toe which was slightly swollen. Because of lack of contact and wear the toe-nail had continued to grow. The distance across the arc of the toe-nail was 10 millimeters while the corresponding distance on the other foot was 6 millimeters. The other toes of the foot seemed to function normally.

Probably the most severe crippling that I know was reported to me by a local hunter. This was in a Ring-necked Pheasant. It was shot on the wing and when examined was found to have only stumps for legs. These stumps were brought to me and exhibited to biology classes. One leg had been amputated with about three-quarters inch of the tarsus remaining, the other just above the distal end of the tarsus. The stumps were healed and protected by tough scaly skin. The ends were somewhat enlarged. It seems probable that the bird was caught by a mowing machine just as it flew up. The hunter reported the bird to be in good flesh.—HAROLD C. BURDICK, State Teachers College, Mayville, North Dakota.

A Method of Banding Bank-nesting Swallows.—At the suggestion of Prof. O. A. Stevens I first tried capturing bank-nesting swallows at night by use of a flash light. Since the first attempts the technique has been modified so that it seems quite effective. Two hundred and four swallows have been captured and banded in a four hour period. A total of 1,216 swallows has been banded in three years and 38 live returns taken in the past two years.

Banding is done with from two to fifteen cooperators—usually students from biology and nature study classes at the college. We arrive at the colony soon after sundown. The first operation is to block the nest entrances with crumpled paper towels. One of the assistants who has been along several times—or myself—usually perform this operation with as little disturbance as possible, otherwise many of the birds leave the nest before we are ready to take them. This is especially true on bright moonlight nights.

Next we organize for capturing, banding, and returning the birds. Usually two individuals with focusing flashlights capture the birds by flashing the light into the burrow. The birds usually come to the light readily and can be picked up at the edge of the burrow with the bare hand. When one has a flashlight in one hand and catches as many as nine swallows from one burrow in the other hand—he has practiced! Extremely young birds will not come to the light, and brooding females come only with much coaxing, even prodding with a stick or wire.

The "catchers" pass the birds from a single burrow on to the "carriers" who bring them to the "bander." They are banded and the band numbers and family groupings read to the "recorder." The bander then passes the birds back to the carrier, who carries them to the catchers to return to their original burrows and close them in with the paper wad. The last operation of the evening is to remove all paper wads without disturbing the birds.—HAROLD C. BURDICK, State Teachers College, Mayville, North Dakota.

RECENT LITERATURE

Reviews by Donald S. Farner

BANDING

1. Report of the Bird-Ringing Committee. A. Landsborough Thomson 1943. *British Birds*, 16: 209–213. In 1942, 4,567 birds were banded as compared to 7,099 in 1941, and 55,817 in 1939. Since 1909, 715,314 have been banded. Species banded in greatest numbers in 1942 were the Starling (*Sturnus vulgaris vulgaris* L.), 444; Greenfinch (*Chloris chloris chloris* (L.)), 197; Song Thrushs (*Turdus ericetorum ericetorum* Turton), 349; Blackbird (*T. merula merula* L.), 191; Swallow (*Hirundo rustica rustica* L.), 480; Lapwing (*Vanellus vanellus* L.), 462; Arctic Tern (*Sterna paradisaea* Brünnich), 196. Species which have been banded in greatest numbers since the beginning of the banding program in 1909 are the Starling, 69,882; Greenfinch, 30,118; Chaffinch (*Fringilla coelebs* L.), 33,649; Song Thrush, 68,466; Blackbird, 61,019; Robin (*Erithacus rubecula* (L.)), 23,477; Hedge Sparrow (*Accentor modularis* (L.)), 15,292; Martin (*Delichon urbica* (L.)), 12,313; Manx Shearwater (*Puffinus puffinus puffinus* (Brünnich), 20,007; Lapwing, 40,135; Common Tern (*Sterna hirundo hirundo* L.), 19,670; Sandwich Tern (*Thalasseus sandvicensis sandvicensis*), 17,987; and Black-headed Gull (*Larus ridibundus ridibundus* L.), 14,112. The largest numbers of returns have been from the Starling, 3,106; Greenfinch, 2,433; Chaffinch, 1,472; Song Thrush, 1,373; Blackbird, 2,933; Robin, 2,268; Hedge Sparrow, 1,419; Mallard (*Anas platyrhyncha platyrhyncha* L.), 1,118; Manx Shearwater, 1,101. The highest percentage of recoveries has been in the following species (at least 500 banded): Greenfinch, 8.1%; Yellow Bunting (*Emberiza citrinella* L), 7.1%; Robin, 9.7%, Hedge Sparrow, 9.3%; Little Owl (*Athene noctua* (Scop.)), 9.1%; Barn Owl (*Tyto alba* (Scop.)), 10%; Kestrel (*Falco tinnunculus* L.), 10.1%; Sparrow Hawk (*Accipiter nisus nisus* (L.)), 14.0%; Common Heron (*Ardea*

cinerea cinerea L.), 12.3%; Mallard, 16.0%; Teal (*Anas crecca crecca* L.), 12.0%; Cormorant (*Phalacrocorax carbo carbo* (L)), 20.8%; Shag (*P. aristotelis aristotelis* (L.)), 10.1%; Stock Dove (*Columba oenas* L.), 8.5%; Turtle Dove (*Streptopelia turtur* (L.)), 11.3%; Woodcock (*Scolopax rusticola* L.), 7.7%.

2. Recovery of Marked Birds. E. P. Leach. 1943. *British Birds*, 36: 235–240. This is a list of 110 recoveries reported during 1942. Of interest are 18 recoveries of banded Teal (*Anas crecca crecca* L.) including three recovered in Holland (1941) and two in Denmark (1940 and 1941). Even more remarkable, considering the times, is the report of the recovery of a Black-headed Gull (*Larus ridibundus ridibundus* L.) September 18, 1942 in Denmark. There were 17 Lapwing (*Vanellus vanellus* L.) recoveries. A Rook (*Corvus frugilegus frugilegus* L.) was recovered at Wells thirteen years after it was banded at the same place.

3. The Age of Some More Birds. David Lack. 1943. *British Birds*, 36: 214–221. The author continues his excellent observations on the natural life span of birds as based on banding data. His calculations from returns on trapped Robins (*Erithacus rubecula melophilus* Hartert) show that 62% of this species die each year; hence the expectancy of life on August 1 is 1.1 years. Mortality during the year after the first August 1 of life is 1 year. Although surviving the first year increases the chances of further survival additional years do not affect the life expectancy.

In the case of the Lapwing (*Vanellus vanellus* L.) the expectation of further life for any adult, regardless of age, is 2.5 years; 33% of the adults die each year. It is possible that the first-year birds do not survive quite as well although the difference is small. These data imply that in order to maintain a constant population each 100 adult birds must each year raise 33 young which survive to breed. Since of each 100 juvenile birds alive on August 1, 62 survive to breed, each 100 adult birds must produce 53 young birds alive on the first of August following hatching in order to keep the population constant. This amounts to 1.06 young (alive on August 1) per breeding pair per season. Kraak, Rinkel, and Hoogerheide (Ardea, 29: 151–174, 1940) found in their studies in Holland that 40% of the population dies each year and that the life expectancy of adult birds is about 2.0 years regardless of age. These authors calculated that each 100 adult birds must raise 70 young (alive on August 1 following hatching) per season in order for the population to remain constant. This amounts to 1.4 young (alive on August 1 following hatching) per pair per season. Lack as well as Kraak, Rinkel, and Hoogerheide was unable to obtain information on the mortality rate between hatching and the time that the young fly.

Recoveries of European Woodcocks (*Scolopax rusticola* L.) were largely from birds collected by shooting. The author assumes that the older birds are shot as easily as the young, an assumption which he admits is unproven. Basing calculations on this assumption, however, it is concluded that the expectancy for first-year birds (on August 1 following hatching) is 1.7 years whereas the expectancy of the older birds is 2.2 years. About 37% of the adults die each year. "Of every 100 juveniles alive on August 1 about 44 survive to breed the next season, hence 37 first year breeding birds (number necessary to replace the annual adult deaths) correspond with 84 alive on August 1. This means that every 100 adults must each year produce 84 young which survive up to their first August 1, or 1.7 per pair."

In the studies on Black-headed Gulls (*Larus r. ridibundus* L.) there was considerable discrepancy between the data on those birds which were shot and those which were recovered by other means. The life expectancy as calculated for those shot was 0.7 years for the first year of life (August 1 to July 31), 1.6 years for the second year, and 2.7 years for the third year. In the other group life expectancy was 1.8 years for the first year, 2.4 years for the second, and 2.4 for the third.

It is obvious that when shooting is the only cause of death life expectancy increases with age presumably because the birds become warier and harder to shoot. Excluding from the calculation the birds which were shot it was concluded that the adult death rate is 33% per year. Of every 100 juveniles which leave the gullery, 38 survive to the following summer. Therefore 33 birds (number necessary to replace the annual adult deaths) correspond to 87 juveniles which leave the gullery or 1.7 juveniles per pair per season. This figure seems high in considering the fact that the clutch is two or three eggs which suggest that many of the birds "found dead" were actually shot. Data on the Lesser Black-backed Gull (*Larus fuscus graellsii* A. E. Brehm) demonstrate the same point. The expectancy calculated on the basis of shooting data is much lower during the first year than in ensuing years. These examples should inject caution into age studies based on banding data.

This is further emphasized in considering the author's data on the Cormorant (*Phalacrocorax carbo carbo* (L.)) derived almost entirely from shooting. Seventy-nine percent of the first year and 29% of the second year birds died each year. If these data are used in calculated life span it would mean that each pair would have to produce 6.5 young per season which exceeds the average clutch size.

Because the average age of birds is far less (perhaps about one-tenth) than the potential age it appears that natural death is a chance proposition regardless of age although it is possible that in general the death rate is somewhat higher during the first year of life.

MIGRATION

4. Migration and Fate of Transported Juvenile Waterfowl. C. S. Williams and E. R. Kalmbach. 1943. The *Journal of Wildlife Management*, 7: 163–169. These experiments were conducted with the object of discovering whether juvenile birds which have not made a migratory flight show a homing instinct or whether they assume the migratory routes of the members of the species of the region to which they have been moved. A total of 131 juvenile Canada Geese, *Branta canadensis canadensis* (L.), were captured in the Bear River Migratory Bird Refuge in Utah and released in refuges in the Mississippi flyway. "Returns from these transported birds indicate that their migrations, when made, were similar to those of birds native to these refuges. There was no evidence of an urge to return to the Great Basin whence they came." There were only eight returns among 213 transplanted ducklings. Seven of these indicated that the birds remained in their newly adopted flyways. "The exception was a Pintail recovered in its ancestral flyway during the second fall after its release." There is an excellent bibliography.

ECOLOGY AND POPULATION STUDIES

5. A Revision of the Ruffed Grouse. John W. Aldrich and Herbert Friedmann. 1943. The *Condor*, 45: 85–103. This paper is an example of a valuable type of contribution which can be made to avian ecology through the use of museum material. The authors recognize 12 races of the Ruffed Grouse, *Bonasa umbellus* (Linnaeus). It has been possible to correlate the distribution of these races with each of the major biotic communities or biomes of the Upper Austral, Transition, Canadian, and Hudsonian Life Zones with the exception of the grassland biome. Because the Ruffed Grouse is primarily a species of the deciduous forest it is characteristic of the climax community in the Deciduous Forest Biome of the Upper Austral of the eastern United States. It is confined entirely to the subclimax communities, dominated by deciduous species, in the

Canadian and Transition Zones of the mountains of the Pacific Coast region of western United States where coniferous species are the climax dominants. The Hudsonian race is *yukonensis* which is found in White Spruce—Lodgepole and Black Spruce—American Larch associations of the Northern Conifer Ecotone (chiefly subclimax communities). Canadian Zone races (chiefly subclimax communities in Spruce—Fir Biome) are *umbelloides* of the Englemann Spruce—Alpine Fir and White Spruce—Balsam Fir Associations, *affinis* of the Lodgepole Pine—Mountain Hemlock Association, and *monticola* of the Red Spruce—Fraser Fir Association. The Transition Zone races can be divided according to biomes and ecotones. (1) The Northern Conifer-Deciduous Forest Ecotone (climax and subclimax communities) has two races, *togata* of the Eastern White Pine—Sugar Maple—Eastern Hemlock Association and *monticola* of the Eastern Hemlock—Yellow Birch Association. (2) Grassland—Northern Conifer Ecotone is characterized by a form intermediate between *umbelloides* and *incanus* found in climax and subclimax communities of American Aspen—Paper Birch Association. (3) Races of the Western Mountain Transition Biome (chiefly in subclimax communities) are *incanus* and *umbelloides* of the Ponderosa Pine—Douglas Fir Association, *affinis* of the Sugar Pine—Ponderosa Pine Association, and *phaios* of the Western Larch—Western White Pine Association. (4) The Pacific Moist Forest Biome has three races all found in the Western Red Cedar—Western Hemlock Association (chiefly in subclimax communities); these are *sabini*, *castaneus*, and *brunnescens*. Three races are Upper Austral all occurring in the Eastern Deciduous Forest Biome (climax and subclimax communities). These are *umbellus* which occurs in the White Oak—Pitch Pine Association and the Red Oak—Beech Tulip Association and the Beech Tulip Association in which *monticola* also is found, and *medianus* of the White Oak—Shag Bark Hickory Association. A map shows the geographic distribution of these races. The paper is commendable in that it brings together Merriam's Life Zones and the biome concepts of recent ecologists. It is hoped that this will further a mutual examination of the desirable concepts of both schools. "Several well marked clines or trends in geographic variation are noticeable. Generally speaking brownish hues prevail on the two coasts while grayish tones replace them in the interior and to the north. Other clines are found in the relative darkness and pallor of pigmentation and in the proportion of the tarsus covered by feathers. Tarsal feathering reaches its maximum extent in Alaska and decreases in amount to the southward. The difference is even more pronounced in progressing both to the east and to the west of the Rocky Mountain region."

6. The Prairie Chicken in Illinois. Ralph E. Yeatter. 1943. *Illinois Natural History Survey Bulletin*, 22: 377–416. The Greater Prairie Chicken, *Tympanuchus cupido americanus* (Reichenbach), was originally distributed over the grasslands of Illinois. These grasslands which covered almost 60% of the State were avoided by the early settlers who cleared the timberlands for agriculture. The prairie chicken extended its range into these areas from the adjacent prairies. When the prairie sod was broken and grain became common the prairie chicken population increased enormously. This increase apparently reached its maximum development in the decade of 1860. From this time on agriculture became more intensive and the prairie chicken population decreased. At the present time the range is about 9% of the original. It consists of 2,600 square miles of gray soil prairie in the southeastern counties, 50 square miles of sand prairie along the Green River in Lee County in northwestern Illinois, and about 200 square miles of small areas principally in northern and south central Illinois. The areas now occupied by the Prairie Chickens are those of prairie soils of low fertility where special agricultural procedures and idle land create favorable habitats. In the southeastern range redtop grass is grown almost exclusively and

provides favorable cover throughout the year. Of particular value is the protection afforded by red-top grass during the nesting season and while the chicks are very young. In this range there is a relatively high percentage of uncultivated land which gives a certain amount of food and protection. However, the author believes that this is a secondary factor in the survival of the species in the red-top areas.

Much of the information used in this paper is derived from research of several years in a study area of four square miles in Jasper County, southeastern Illinois. In this area, "the evidence of sexual display in the male occurs on booming grounds in late January or February. This display reaches a climax in late April and ends about mid-June." The author presents evidence to show that there is a considerable difference in the development of the sexual cycle in the male and female. Hatching began in early May and reached a peak in the first half of June. In 1935–1936 in the study area 60% of the total nesting cover was red-top; it contained 36% of the nests, 57% of which were successful. Thirty-six percent of the cover was idle field and pastures containing 30% of the nests of which 33% were successful. Four percent of the cover was waste grassland containing 34% of the nests of which 54% were successful. The average clutch was 12.3. The highest density of nests observed in the study area was one nest per acre. Ninety-three percent of the eggs known to have received normal incubation hatched. Principal causes of nesting losses observed were predators, nest desertion by female, farming operations, and failure of eggs to hatch. Losses were greater early in the season. However these were replaced largely by renesting. Nests begun later than mid-June usually were unsuccessful. "Fall censuses of the Jasper County study area, beginning in 1935 and ending in 1941, showed a variation in population densities from one bird per 10 acres to one bird per 18 acres. The average was one bird per 14.3." Tabulations of stomach analyses show that the adult diet consists of 91% vegetable food and 9% animal food; the analyses of 14 young collected in late June, July, and August, 1936 and 1937, show 60.5% vegetable food and 39.5% animal food. Because of the abrupt transition from a diet consisting principally of animal food to one of vegetable food in the young of gallinaceous species, it is unfortunate that the author could not include more precise age data for the stomach analyses. It was found that flocking may begin as early as mid-August. Winter flocks contain from 12–75 birds. Dispersal from winter flocks takes place in March. This well-prepared paper contains much information, the result of an investigation of several years' duration. Its recommendations for future management, including a continued closed season, appear to be sound.

7. Preferential Rating of Duck Food Plants. Frank C. Bellrose, Jr. and Harry G. Anderson. 1943. *Illinois Natural History Survey Bulletin*, 22: 417–433. Speaking of previous studies the authors state: "In all these studies each plant species has been judged solely on its use, as determined in the laboratory analyses of stomachs. While this method ascertains the important duck food plants it does not reflect the relative values of these plants, for no consideration is given the abundance of the plant species in the areas in which the stomachs have been collected." In order to correct this the authors have employed an "index rating" derived by dividing the "percent of use" of the various plants (calculated on the basis of the volume of seeds in the gizzards) by the percentage occurrence of the plants in the environment. Hence an index of 1.0 indicates that the plant is used approximately in proportion to its abundance. There are certain disadvantages in this method of study. Ducks may have fed at lakes distant to the lake where they were collected. Also there are local variations in the feeding habits of the species. The amount of seeds produced varies in each species of plant thereby changing their relative importance from year to year. Changes in water

level may affect the accessibility of certain plants. The authors base their conclusions on three years' study in Illinois during which 3,200 duck stomachs were examined. In this group there were 1,907 Mallards, 669 Pintails, 225 Green-winged Teal, 110 Blue-winged Teal, and 82 Baldpate. The following were concluded to be excellent duck food sources. Numbers given are the index value averages for 1938, 1939, and 1940. Rice cut-grass, *Leersia oryzoides* (Linnaeus) Swartz, 13; Walter's millet, *Echinchloa Walteri* (Pursh) Nash, 10; Wild and Japanese millets, *Echinochloa crusgalli* (Linnaeus) Beauvois and *E. frumentacea* (Roxburgh) Link, respectively, 3; Moist-soil smartweeds, *Polygonum pennsylvanicum* Linneaeus *P. lapathifolium* Linnaeus, *P. hydropiperoides* Michaus, and other *Polygonum*, spp., 4; Nutgrasses, *Cyperus erythrorhizos* Muhlenberg, *C. esculentus* Linnaeus, *C. strigosus* Linnaeus, 7. Lists of good, fair, and poor duck food plants are also given. This is an excellent piece of research.

8. Further Additions to the List of Birds Known to be Parasitized by the Cowbirds. Herbert Friedmann. 1943. The *Auk*, 60: 350–356. The author has listed new records of parasitism by the cowbirds for the last four years. New records of forms parasitized by the Eastern Cowbird, *Molothrus ater ater* (Boddaert) are the Black-billed Cuckoo, *Coccyzus erythropthalmus* (Wilson); Black-capped Chickadee, *Penthestes atricapillus atricapillus* (Linnaeus); Mountain Vireo, *Vireo solitarius alticola* Brewster; and Philadelphia Vireo, *Vireo philadelphicus* (Cassin). This increases to 149 the number of forms known to be parasitized by the Eastern Cowbird. New records for the Nevada Cowbird, *Molothrus ater artemisiae* Grinnell, are Wilson's Phalarope, *Steganopus tricolor* Vieillot; Sage Thrasher, *Oreoscoptes montanus* (Townsend); Western Robin, *Turdus migratorius propinqus* Ridgway; and Eastern Hermit Thrush, *Hylocichla guttata faxoni* Bangs and Penard. The Nevada cowbird is now known to parasitize 92 forms. New Records for the Dwarf Cowbirds, *Molothrus ater obscurus* (Gmelin) are the Texas Vireo, *Vireo belli medius* Oberholser; Yellow-headed Blackbird, *Xanthocephalus xanthocephalus* (Bonaparte); Gulf Coast Red-wing, *Agelaius phoeniceus littoralis* Howell and van Rossem; Brewer's Blackbird, *Euphagus cyanocephalus* (Wagler); Lawrence's Goldfinch, *Spinus lawrencei* (Cassin); San Francisco Towhee, *Pipilo maculatus falcifer* McGregor; Montana Junco, *Junco oreganus montanus* Ridgway; and Samuels's Song Sparrow, *Melospiza melodia samuelis* (Baird). There are now 96 forms for which there are records of parasitism by the Dwarf Cowbird. There are also two new records for the Argentine Shiny Cowbird, *Molothrus bonariensis bonariensis* (Gmelin), increasing its list to 115; one for the Western Shiny Cowbird, *M. b. occidentalis*, increasing its list to eight forms; and two new records for the Small Shiny Cowbirds, *M. b. minimus* Dalmas, increasing the number of hosts of this subspecies to 26. The Texas Sparrow, *Arremonops rufivirgatus rufivirgatus* (Lawrence), is listed as a new host record for the Bronzed Cowbird, *Tangavius aeneus* (Wagler).

9. Census of Swallows and House Martins in the Sedbergh District, N. W. Yorkshire. M. P. Winser and J. M. B. King. 1943. *British Birds*, 37: 32–34. These census figures are interesting and might be of value for comparison in similar work in this country. The territory which is covered contains "for the most part a valley which is grassland, parts of which are now under cultivation. The valley is no lower than 400 ft. above sea-level. The fields end at about the 700 ft. mark and the fells, which are good for sheep grazing, are covered with grass and bracken." The town of Sedbergh was not included in the censuses. In 1938 there were 17.2 pairs of Swallows, *Hirundo rustica rustica* L., and 6.5 pairs of Martins, *Delichon urbica urbica* (L.), per 1000 acres. In 1942 in exactly the same area there were 15.0 pairs of Swallows and 13.6 pairs of Martins per 1000 acres. "There seems to be no relationship between Swallows and House-Martins,

but on individual farms Swallows are rarely found if there are more than 4 or 5 pairs of Martins."

10. Distribution and Habitat Relationships of the Phainopepla. James E. Crouch. 1943. The *Auk*, 60: 319–331. The author discusses in detail the geographical distribution of this species, *Phainopepla nitens lepida* Van Tyne. Breeding occurs in the Upper and Lower Sonoran life zones especially in the latter. The limiting factor appears to be the distribution of vegetation. The most important plant is the mistletoe (*Phoradendron*) which grows frequently on the mesquite (*Prosopis*) and ironwood (*Olneya*). Phainopeplas apparently have adjusted themselves somewhat to the changes in conditions caused by man. They have become quite common in orange groves and apricot orchards in some areas. Migration in this species seems to be complex. There is apparently a definite northward migration in spring although there is perhaps also a simultaneous migration from east to west across the mountains. Conversely it is possible that there is an eastward migration as well as a southward migration in fall. The author emphasizes the need for banding studies on this species.

11. The Index of Heron Population, 1942. W. B. Alexander. 1943. *British Birds*, 36: 206–208. This is a compilation of reports on 90 heronries, most of them in England, a few of them in Scotland. Fifty-two of these were also included in the 1928 survey when they contained a total of 1,204 nests. The same 52 contained a total of 862 nests in 1942. Seventy-nine heronries whose total average number of nesting pairs for "normal years" was 1,654, had in 1942 a total of 1,123 nesting pairs. There was a decrease of 5% in 1942 from the numbers of 1941. This decrease was greatest in southwestern England, eastern England, and northwestern England.

12. Ecology and Management of the Mourning Dove, *Zenaidura macroura* (Linn.), in Cass County, Iowa. H. Elliot McClure. 1943. Agr. Exp. Sta. Iowa State Coll. Agr. and Mech. Arts, Research Bull. No. 310: 355–415. Three seasons' observations on "nearly 4,000 nestings" showed a percentage of eggs producing successful young, i.e., reaching the age of 14 days, of 54, 44, and 38, averaging 45, which corresponds closely to the success found for passerines in open nests. The average number of young raised per nest was 1.82, and the percentage of successful nestings 48. Interesting observations are given on the ecology of the birds.

Of the 1,643 nestlings banded, 81 (4.9 per cent) were recovered the same season in or near Lewis where the study was made. (Iowa has no open season on Doves.) Twenty-one (1.3 per cent) were recovered in fall and winter in Oklahoma, Texas, Louisiana and Mexico. Only one was retaken in the breeding season; it was killed by a cat 8 miles from Lewis. "No banded birds were noted to return to Lewis," p. 409.

It is a pity that the author did not carefully study the pertinent literature before he started on his time-consuming enterprise; he is mistaken on the elemental matter of the intervals at which Mourning Doves lay their eggs; he is confused on the problem of 3 eggs to a nest; he assumes that a squab might start to migrate at 19 days, although telling us that "growth of flight and tail feathers continued until the young were over a month old." He says that a Dove population will treble in a season; his calculations on pp. 410–12 show them trebling and quadrupling! The undue size of these estimates are partly due to an error in the author's method, and also, I believe, to underestimations of the actual breeding populations and of their losses. For detailed criticism see the review in the September Wilson Bulletin.—M. M. Nice.

13. Territoriality, Display, and Certain Ecological Relations of the

American Woodcock. Frank A. Pitelka. 1943. The *Wilson Bulletin*, 55: 88–114. The data and conclusions in this paper are based on "approximately 40 hours" of observations on the American Woodcock, *Philohela minor* (Gmelin), during a single period, five weeks in the spring of 1939, in northern Illinois. Most of the observations were apparently confined to three males. The author has mapped the feeding and display areas of these three males. Feeding areas were 250–300 feet in diameter and were not defended. Display areas were located in open areas adjoining the respective feeding areas and were defended. The roles of the "call note of advertisement and display", the cackle note used in assault and attack, and song flight which functions "chiefly in territorial advertisements" are discussed. There is an elaborate treatment of the data involving six tables and ten figures some of which seem superfluous. Considerable meteorological data are included but there are scarcely sufficient observations of the birds to make reliable correlations. Although this paper contains some interesting and valuable observations it does seem that considerably more investigation is needed to amply establish its conclusions.

LIFE HISTORY

14. Notes on the Life History of the Silver-eye Based on Colour-banding. C. A. Fleming. 1943. The *Emu*, 42: 193–216. This is an interesting banding study conducted at Wellington, New Zealand. Silver-eyes, *Zosterops lateralis* (Lath.), and other members of the *Zosteropidae* occupy an ecological niche similar to that of the vireos of the new world. In the spring of 1939, 38 birds were banded. Most of these belonged to the local breeding population. (Silver-eyes are non-migratory.) Eight of these 38 were banded as young. During the winter 16 (42%) of the adults were recovered; none of the eight young were recaptured. In the winter and spring of 1940, 297 birds were banded; 65% were never recovered. About 18% remained until after the beginning of September; 4.7% were found breeding in 1940. A population density of 24 pairs per acre of garden (exclusive of roads) was found. This density was exceeded only by that of the house sparrow.

In April–June most birds have finished molting and are in foraging flocks. There is very little song. In July flocks continue to forage in the treetops but tend to break into pairs when disturbed. There is occasional song. During August the birds are renewing the plumage of the head. Single males begin to isolate themselves to restricted areas sometimes accompanied by females. "Some of the August couples noted were the same as later nesting pairs, but others were temporary associations." In September "temporary mating continued to be recorded, song territories were still held by solo males, occasionally accompanied by females. The challenge song, probably associated with a mated pair attached to territory, . . . comes from more and more territories as the month progressed." In October more and more permanent matings occur. Nesting begins and the first clutches are laid in the second week. During the third week of October the first clutches hatch. By this time most pairs are permanently settled. In November more clutches are completed and the first young take to flight. Territories break down although some parents have left the young and are again defending territory in preparation for the second nest of the season. Breeding continues through December and January. February–March is characterized by the resumption of song and the beginning of flocking.

Incubation began after laying of the first egg whether or not a third was to be laid. Incubation period is 10–11 days.

15. Annual Cycle of the Black-capped Chickadee—3. Eugene P. Odum. 1942. *The Auk*, 59: 499–531. Parts 1 (The *Auk*, 58: 314–333), 2 (The *Auk*,

58: 518–535), and 3 bound together, $0.25. The author, University of Georgia, Athens, Georgia. (For more detailed reviews of Parts 1 and 2 see BIRD-BANDING, 12: p. 179–180, 1941 and 13: p. 43, 1943.) This monograph summarizes a complete year of observations from banding of the Black-capped Chickadee, *Penthestes atricapillus atricapillus* (L.), at the Edmund Niles Huyck Preserve, Rensselaerville, New York. The author divides the annual cycle into the six major seasonal patterns: (1) *Prevernal* (March) with "spring movements characterized by increasing restlessness and singing, shifting of birds from one flock to another, appearance of new birds, and disappearance of others". (2) *Vernal Period* (April) in which the flocks disperse, pairs are formed "apparently resulting from a simplified courtship; beginning of territory establishment *following rather than preceding pair-formati n*". (3) *Estival Period* (May–June) which is the period of actual nesting. The male and female both work at the excavation of the nest hole but only the female carries nesting material and incubates. The male feeds the female during egg-laying and incubation. The incubation period is about 13 days; the young remain in the nest 16 or 17 days and are attended by the parents for a month or less after leaving the nest. (4) *Serotinal* (July–August) "characterized by movement and flocking of juveniles and the molting of adults". Flocks reappear. "The family group does not form the basis of the flocks since juveniles scatter widely while adults remain for the time being on or near the former nesting territories." (5) *Autumnal period* (September–November) with large populations, mixed flocks, and "general high sociability". (6) *Hiemal Period* (December–February) when most individuals remain restricted to areas of 20–50 or more acres and are associated in small flocks.

The author has recorded some interesting data on population density. On the preserve the population density reached a maximum, 30 birds per 100 acres (not corrected for non-suitable habitat) in October; at this time the density in the village vicinity was about 10 birds per 100 acres. In December the densities were about the same for the Preserve and the village, 15 birds per 100 acres. In February the Preserve density remained at 15 birds per 100 acres whereas that of the village increased to 25 per 100 acres as the population probably shifted toward the valleys. In March the village density increased to 29 per 100 acres and the Preserve density to 17 per 100 acres. In May the density in both areas dropped to five or six birds per 100 acres as the winter visitants departed. It would be of tremendous value if similar data could be obtained for this area for subsequent years.

The sixteen notes and calls are described in detail and discussed in reference to their role in behavior. Territories varied in size from 8.4–17.1 acres (mean, 13.2 acres). The numbers of eggs per clutch varied from five to eight, with four out of seven having seven eggs. Eggs are laid one each day. Of the nests observed carefully 60% were successful; 70% of the eggs laid were fledged. Detailed study of the dominance order in one of the winter flocks revealed that "dominance seemed to be well established and uni-directional between many individuals but the dominance order was not entirely linear or fixed". Part 3 contains a good general summary of the entire study. The bibliography is well selected although Palmgren's excellent study, "Zur Biologie von *Regulus r. regulus* (L.) und *Parus atricapillus borealis* Selys." (Acta Zoologica fennica, 14: 5–113, 1932), might have been studied and cited. This study not only supplies some valuable information on the chickadee but also provides an example of the type of study that needs to be done on many species. H

REPRODUCTION

16. Observations on the Colonies of the Arctic Tern (*Sterna macrura* Naumann) **on the Farne Islands.** W. S. Bullough. 1942. *Proceedings of the*

Zoological Society of London, 112, Sec. A: 1–12. "The Arctic Tern has nested on the Farne Islands for as long as records exist, and its colonies are situated side by side with the nests of the Sandwich Tern (*Sterna sandvicensis sandvicensis* Latham), Common Tern (*S. hirundo hirundo* L.), Roseate Tern (*S. dougalli dougalli* Montague), Eider Duck (*Somateria mollissima mollissima* (L.)), Lesser Black-backed Gull (*Larus fuscus fuscus* L.), and occasionally Oyster Catchers (*Haematopus ostralegus* L.) and Ringed Plovers (*Charadrius hiaticula hiaticula* L.)." Nesting territories of the Arctic Tern were found to be small and nests were usually nine or ten feet apart. Territorial lines were found to be very flexible. Intruders were driven away when they approached the nest. Actually the distance from the nest which intruders were allowed to approach varied considerably. Although quantitative data are not given the author states that the eggs and young in the larger colony on Inner Farne Island were on the average much further advanced that those in the smaller colonies on the other islands. This agrees with the observations of Darling (1938) on gulls. Nesting was with equal success on several types of ground including sand, pebbles and rocks, thick vegetation, and short grass turf. At first the chicks did not understand the territorial system. However in the course of a day or two the young learn the boundary lines of the parents' territory "taught partly by the hostile reception it receives when it crosses them (territorial boundaries) and partly by the fact that it is only fed when near its own nest". Adults do not recognize their own chicks unless they are within the territory; they neither feed nor protect them outside of the territorial limit.

17. Size of Breeding Populations in Relation to Egg-laying and Reproductive Success in the Eastern Red-Wing (*Agelaius p. phœnicius*). Harry M. Smith. 1943. *Ecology*, 24: 183–207. Areas were selected so that large and small breeding aggregations could be compared. The largest marsh was five acres in area with cat-tails (*Typha latifolia* and *angustifolia*) as the principal type of cover. The nesting aggregation (Group A) in this area had 128 completed nests in 1940 and 167 in 1941. There were 24 smaller localities (Group B) with various types of cover including *Typha*, *Typha* and *Sparganium*, *Sparganium*, *Cephalanthus*, *Scirpus*, and *Solanum*. Group B had 75 complete nests in 1940 and 189 in 1941. The total area of the Group B habitats was 12.8 acres. Egg laying in Group A began 2 days earlier in April than Group B and had a higher degree of synchronization. (Brood II data are scarcely sufficiently extensive to draw conclusions.) This is in agreement with the observations of Darling (1938) on breeding colonies of gulls. However the reproductive success in Group A and Group B was identical (59.7 and 59.3% respectively) whereas in gulls (Darling) it was found that the larger colonies were more successful. Among the smaller groups of Redwings there were no positive correlations between reproductive success and the size of the colony. Group A had an edge of about 3,000 linear feet whereas Group B had an edge of about 16,000 feet; hence there was no apparent "edge effect" on reproductive success or the number of nests. There was likewise no correlation between population density and nesting success. An interesting paper.

18. An Investigation into the Roles of Males in Relation to Incubation. B. H. Ryves. 1943. *British Birds*, 37: 10–16. The author emphasizes the importance of distinguishing between *brooding* and *incubating* in reference to clutch. *Incubation*, especially in passerine species, requires a physiological adaptation to enable the bird to warm the eggs sufficiently for development. *Brooding* of the eggs is merely the occasional sitting on them without raising their temperature enough to produce development. Three categories are proposed: (1) Species in which the females undertake incubation and males may occasionally be observed brooding the eggs. (2) Those in which the males undertake a definite

and proved part in incubation throughout the period. Seabirds, shorebirds, some hawks, and others. (3) Those in which the male alone undertakes incubation. Phalaropes. Most of the paper is concerned with a critical examination of the "incubation" habits of the males of several species of British Birds.

19. Brood-Patches and the Physiology of Incubation. B. W. Tucker. 1943. *British Birds*, 37: 22–28. This is an interesting summary of the literature dealing with brood-patches. "In some types of birds, such as passerines, birds-of-prey, grebes, and pigeons, there is a single median brood-patch. In others, such as waders and gulls, there are a pair of lateral patches and a median posterior one. In the gallinaceous birds there are also three patches, but the median one is between rather than behind the other two, with which it becomes more or less confluent." It is emphasized that an increase in vascularization occurs with the loss of feathers. Cormorants and Gannets do not have brood patches; however, in the Gannets the feet which are well vascularized, are used to warm the eggs. There also are no brood-patches in ducks and geese although the extra insulation provided by the down placed in the nest apparently results in temperatures high enough for the development of the eggs.

20. A Nesting Study of the Wood Thrush. Hervey Brackbill. 1943. The *Wilson Bulletin*, 55: 73–87. This paper summarizes 75 hours' study of a color-banded pair of Wood Thrushes, *Hylocichla mustelina* (Gmelin), in Baltimore in 1942. The male established territory on April 29. Incubation was entirely by the female who was on the nest 68% of 940 minutes observed during the first brood incubation and 80% of 1014 minutes during the second brood incubation. Twenty-three complete periods ranged from seven to 58 minutes. Attentive periods during the first brood averaged 8.5 minutes as compared to 6.5 during the second. Brooding also was done only by the female. Both parents shared feeding and nest sanitation. The first brood left the nest at 12–13 days; the second at 8–10 days. After leaving the nest the young were fed by the parents until the age of 25–32 days. The first brood was fed at the rate of 9.3 feedings per hour as compared to 4.7 for the second.

21. The Breeding of the Marabou Stork in East Africa. M. E. W. North. 1943. The *Ibis*, 85: 190–198. Although the Marabou Stork (*Leptoptilos crumeniferus* Lesson) is a common bird in East Africa, breeding records are scarce. The author has listed both previously published records as well as new records. In Kenya and Uganda he lists five records of colonies varying in size from 8 to more than 100 nests each. There is a single known colony in Tanganyika with about 100 nests. Colonies along the Juba River in Italian Somaliland have decreased from 1500 nests to no more than 300 in 1941. There are probably also colonies on the Webi Shebelli River in Italian Somaliland. The breeding season begins in October or November during the short rains. Nests are either in tall forest trees or thorned acacias.

22. Breeding Notes on the Phainopepla. A. L. and R. M. Rand. 1943. The *Auk*, 60: 333–341. This paper is based on observations made by the authors near Tucson, Arizona, during the period, February to June, 1940. The males established territories and "advertised themselves visually, by conspicuous perching and display flights instead of singing". The first eggs were observed on March 3. The males started nest building before they were mated; females aided in completing the nests. Courtship flights, including both sexes, and courtship feeding were observed. "Usually male and female shared nest duties, but at one nest the male alone fed the young." Territory defense ceased during incubation but reappeared after the young had hatched.

23. Some Observations on the Marsh-Harrier. Eric J. Hosking. 1943

British Birds, 37: 2–9. In the 60 years prior to 1927 there were only two authentic breeding records of the Marsh Harrier, *Circus aeruginosus aeruginosus* (L.), in Great Britain. Since 1927 a very small number, no more than three breeding pairs per season, have been recorded from Norfolk. The author made observations on these Norfolk birds during the summer of 1942. Among the more interesting of his observations was that of observing a male feeding two females occupying nests about 300 yards apart, the first record of polygamy in the species. The paper contains many interesting observations on feeding habits, both of adults and young. There are four excellent photographs.

24. Nidification of the Passerine Birds of Hispaniola. James Bond. 1943. The *Wilson Bulletin*, 55: 115–125. Primarily an annotated list of nests of passerine species of Hispaniola with remarks on the bearing of nidification in the relationship of certain species.

PHYSIOLOGY

25. Light Requirements of the Weaver Finch. Marie Rollo and L. V Domm. 1943. *The Auk*, 60: 357–367. These experiments have been performed with 39 male Weaver Finches, *Pyromelana franciscana* (Isert), in eclipse plumage. It was found that the optimum daily light period necessary for producing nuptial plumage was 13–14 hours and that longer and shorter daily periods actually retarded the appearance of the nuptial plumage. It was found that it was possible by regulating the daily periods and intensity of light to bring the birds into nuptial plumage at any time during the year and to sustain the nuptial plumage indefinitely. When exposed to nine or ten hour daily periods of light birds in eclipse plumage do not assume nuptial plumage and those in nuptial plumage pass into eclipse plumage. The optimum light intensity was found to be about 126 foot candles; however, "given enough time, any intensity sufficient for the survival of the birds will produce nuptial plumage provided that they have the optimum period". It is stated that there is an increase in the size of gonads correlated with the change to nuptial plumage. It is of further interest to note that an excessively long light period may cause birds in nuptial plumage to go into partial molt. These are significant experiments in avian physiology. It would be of great interest if the actual physiological mechanism involved could be ascertained. The possible roles of the pituitary and the gonads should make very interesting research.

26. The Spring Molt of the Gambel Sparrow. Harold Michener and Josephine R. Michener. 1943. The *Condor*, 45: 112–116. Interesting data on the spring molt of this species, *Zonotrichia leucophrys gambelii* (Nuttall), are recorded in this paper. These data indicate that the spring molt may begin any time between late January and early February. At least among those starting to molt in January and February the duration was about two months. Details of the molt in relation to the tracts involved are given.

27. The Nature of the Red, Yellow, and Orange Pigments in Woodpeckers of the Genus *Colaptes*. Frederick H. Test. 1942. *University of California Publications in Zoology*, 46: 371–390. Carotenoid pigments from the flight feathers of *Colaptes auratus* (L.) and *Colaptes cafer* (Gmelin) and their hybrids as well as those from the malar stripe feathers of *cafer* and the nuchal crest feathers of *auratus* were extracted, separated, and studied spectroscopically. It was concluded that the yellow color of *auratus* is due principally to xanthophylls and to a lesser extent to carotenes and that the scarlet of *cafer* is due in the larger part to red carotenoids with absorption maxima of 475–500 millimicra.

The presence in the flight feathers of *cafer* of some xanthophylls and carotenes like those of *auratus* was also detected. Flight feathers of the hybrids contained carotenes, red carotenoids, and xanthophylls as in *cafer* but in different proportions. Red in the malar feathers of *cafer* and the nuchal crescent of *auratus* is due mostly to red carotenoids; these feathers contain also small amounts of xanthophylls and perhaps carotenes.

28. Geophysical Phenomena and the Activity of *Otus asio*. Leon Kelso. 1942. *Biological Leaflet No.* 15, 4 pp. Published by the author. The author in studying five young Screech Owls, *Otus asio naevius* (Gmelin), reports that at or shortly before the new moon phase there was a drop in average weight of five or more grams. Certain correlations are made with the departures of the male from perch and territory during the various moon phases. The observations recorded here are very interesting but it is necessary that sufficient data be obtained for reliable statistical analyses. Also caution should be exercised in nterpreting such correlations as cause and effect.

29. Nighthawk Activity and Lunar Cycle. Leon Kelso. 1942. *Biological Leaflet* No. 16, 2 pp. Published by the author. In this paper it is asserted that the bulk of the daytime activity of Nighthawks, *Chordeiles minor chapmani* Coues and *C. m. minor* (J. R. Forster), excluding that preceding storms, occurred in the last quarter and early new moon phases. It appears that more data are needed to fully establish this observation.

30. The Moon and *Strix*. Leon Kelso. 1942. *Biological Leaflet* No. 71, 2 pp. Published by the author. According to the author there is a tendency in the Barred Owl, *Strix varia* Barton, to leave the perch earlier during high tide stress. Since the observations are based entirely on the behavior of a single female and further because the average difference in departure between high and low tide stress is very small (3.5 to 8.0 minutes) many more data are needed to establish this point firmly.

31. Weight Variation in *Otus asio*. Leon Kelso. 1942. *Biological Leaflet,* No. 18, 4 pp. Published by the author. The author's data and graph show a weight rhythm in five young Screech Owls, *Otus asio naevius* (Gmelin). Weight tended to increase more noticeably during the first quarter and full moon phases. Unfortunately a statistical analysis was not made to determine whether or not the observed differences (in the order of seven grams in 160) are true differences.

BEHAVIOR

32. Sexual Behaviour in British Birds from October to January. Averil Morley. The *Ibis*, 85: 132–158. The author has compiled notes on the winter sexual behavior of seventy-five species of British birds. Both the compilation and its bibliography of 150 titles should prove to be valuable.

ANATOMY AND EMBRYOLOGY

33. Some Additional Anatomical Factors Bearing on the Phylogeny of the *Struthiones*. Percy R. Lowe. 1942. *Proceedings of the Zoological Society of London*, 112, Ser. B: 1–20. The author supplies further evidence to support his theory that the struthioniform birds are not a group with degenerate organs of flight but rather "surviving relics of a primative avian stock which had advanced a few steps further toward flight and the complete avian status than certain bipedal dinosaurs such as *Ornitholestes hermanni hermanis*". The hand

bones of this reptile "exhibit a perfect adumbration of what is to come in the bird". He cites as further evidence of this relationship the fact that the preaxial division of the *Flexor carpi ulnaris* muscle in Rhea is nothing more than a "very thin fleshy slip" whereas neognathous birds, flight and flightless, have a much larger and better developed preaxial division which is larger than the postaxial portion of the muscle. The author regards the condition in Rhea as primative and not degenerate. He cites as further evidence of primativeness the fact that the muscle has no connections with "neither lesser, median, nor greater under wing coverts". The paper also considers the phylogenetic position of the tinamous "All evidence appears to fully substantiate the claim of the tinamous to be paleognaths." They are regarded as a more modern and successful development of paleognaths than the *Struthiones* and the only paleognaths known to be even partially successful in flight. Accordingly the author recognizes three or four categories of paleognaths. (1) *Cursorial group* represented by present-day *Struthiones* as well as the *Diornithiformes* and such fossil forms as *Gastornis*. (2) *Flying group*, the tinamous. (3) *Apteryx*, "difficult to classify". (4) *Aquatic or swimming group* represented by *Hesperornis*, a provisional suggestion, depending on whether or not the palate is paleognathous.

34. Comparison of the Embryo of the Emu with the Corresponding Stages of Carinate Birds. (Vergleich zwischen Emu-Embryo und entsprechenden Caranitenstadium.) Hardy Lutz. 1942. *Revue Suisse de Zoologie*, 49: 299–399. Two embryos, 15 and about 20 days old, of the Emu, *Dromiceus novae-hollandiae* (Latham), have been studied comparatively with the embryos of carinate species including *Fulica atra* L., *Podiceps cristatus* (L.), *Meleagris gallopavo* L., *Anser anser* L., *Cygnus olor* (Gmelin), *Columba livia* L., *Syrium aluco* (L.), *Melopsittacus undulatus* (Shaw), *Serinus canarius* (L.), as well as the lizard, *Lacerta agilis* L. The glass plate reconstruction as well as other methods was used. Most of the conclusions on the Emu are drawn from the study of the 15 day embryo. This paper is important as a source of information on comparative avian embryology. From this standpoint it is far too extensive to review. Certain observations, however, are also of importance in ascertaining the phylogenetic origin of the Emu. At fifteen days the general external form, the general aspects of the skeleton, heart, blood vessels, and digestive system of the Emu embryo are similar to those of corresponding stages of the carinate embryos. However in some respects the Emu embryo is more primative. In the Emu embryo the *Pars canicularis* (otic capsule) ossifies independently of the *Pars occipitalis* of the basal plate. The basal portion of the columella in the Emu, *Anas*, and *Gallus* represents the final development of the hyomandibular. It ossifies in connection with the hyomandibular and independently of the *Pars canicularis*. Ossification of the ribs in the Emu, *Anas*, and *Gallus* is independent of the ossification of the vertebrae. There are independent centers of ossification in the dorsal and ventral parts of each of the sternal ribs. The sternal plate ossifies independently of the ribs. Whereas in the carinate embryos there is a single unpaired opercular fold the Emu embryo has a pair of circular opercular papillae. In the Emu the scapula, coracoid, and humerus ossify independently as in *Gallus* and *Anas*. At fifteen days the wing structure although definitely retarded in the Emu as compared with the carinate embryos has essentially the same structure. The leg structure at this time is fundamentally similar to the carinate species although there is a definite change toward the cursorial adaptation. At fifteen days the reptilian nature of the circulatory system is much more evident in the Emu embryo than in the corresponding carinate stages. The *truncus arteriosus* still has three branches and there is a functional left aorta. "The relationship between the proventriculus and gizzard shows in the Emu embryo in comparison to the carinate embryo the primative relationship in which

the proventriculus is more developed than the gizzard." The paired caeca open into the cloaca as in the carinate embryo. The author feels that the Emu must have been derived from an arboreal flying protocarinate stock from which it was separated at a very early date.

HEREDITY, VARIATION, ADAPTATION AND EVOLUTION

35. Notes on the Mearns Quail. Loye Miller. 1943. The *Condor*, 45: 104–109. The author discusses in some detail the anatomy and habits of the Mearns Quail, *Cyrtonyx montezumae mearnsi* (Nelson), and makes certain comparisons with the California Quail, *Lophortyx californica* (Shaw). The Mearns Quail has a color pattern of advantage to a species which stands immobile when alarmed. The relatively large eye of this species may indicate a former forest habitat. The large foot and claws and strong beak are said to be correlated with the feeding habits of tearing sod in search of tubers and larvae as well as shelling and breaking up acorns. According to the author there is a secondary resemblance to the forest dwelling tinamous due to convergent evolution in a similar environment. The author feels that the original habitat of the species was the tropical forest and that its present arid habitat is secondary. It is suggested that the small heart and white pectoral muscle reflect the habit of quick flight with rapid fatigue. An interesting paper.

PARASITOLOGY

36. The Protozoan Blood Parasite, *Haemoproteus lophortyx* O'Roke in Quail at the San Joaquin Experimental Range, California. Carlton M. Herman and Ben Glading. 1942. *California Fish and Game*, 28: 150–153. This malarial parasite of the California Valley Quail, *Lophortyx californica vallicola* (Ridgw.), is transmitted by the hippoboscid, *Lynchia hirsuta* (Ferris). A greater percentage of infection was found among immature birds (93.5%) than in adults (83%) except during the months of August and September when 97% of the adults and 83% of the immature birds were infected. A total of 424 birds were found infected; 259 had 1–10 parasites per 10,000 red blood cells; 112 had 10–50 parasites per 10,000 red blood cells; 41 had 50–100 per 10,000 cells; and 12 had more than 100 parasites per 10,000 red blood cells.

GEOGRAPHICAL DISTRIBUTION

37. Australian Faunal Regions. A. G. Campbell. 1943. The *Emu*, 42: 242–245. The author has proposed a system of faunal regions for Australia based primarily on the distribution of passerine birds. Twelve faunal regions are recognized. (1) the *Tasmanian Region* (Island of Tasmania) has 13 species of passerines peculiar to it alone although all except one have closely related species on the mainland. The Tasmanian Region shares twenty passerine species with the continent. The author regards the species of Tasmania as the "isolated original stock". (2) The *Southwest Region* (extreme southwestern Australia) has 38 species "almost identical" with those of the Tasmanian, South Australian, and Southeast Regions. (3) The *South Australian Region* (small area lying east of the Spencer Gulf and Lake Torrens) and (4) the *Southeast Region* (Broad coastal area of Victoria and New South Wales) have 28 species not found in the Tasmanian. The Southeast has 16 species not found in the South Australian. (5) The *Western Region* (Southwestern Australia and southern Western Australia) has 101 species not found in the Tasmanian, Southwest, South Australian, and Southeast Regions. Many of these are typical interior species. (6) The *South Queensland* (southeastern

Queensland) has 12 species peculiar to it. (7) *Cape York Region* (Cape York Peninsula) has 17 species in common with the South Queensland and no less than 55 of its own peculiar species most of which are similar to Papuan species and doubtlessly Papuan in origin. (8) The *Northern Region* (northeast Queensland, northern part of the Northern Territory, northwestern part of Western Australia) has 84 species peculiar to it alone and 15 species which it shares with (9) the *Northwest Region* (western part of Western Australia). (10) The *Interior Region* (interior of Queensland, Northern Territory, New South Wales, Victoria, and South Australia) has 49 pallid species which are probably derived from the coastal stock. (11) The *Desert Region* (eastern Western Australia) is entirely riverless and with an extremely sparse bird fauna. (12) The *Central Region* (central mountainous mostly in the southwestern part of the Northern Territory) has "several older forms of bird life" which have manage l to persist while the Interior and Desert species are well represented. The author stresses the importance of rainfall in establishing faunal regions; altitude and temperature are not considered as factors of importance.

38. Distribution and Abundance of the Mississippi Kite in the Texas Panhandle. Philip F. Allen and Palmer R. Sime. 1943. The *Condor*, 45: 110–112. The Mississippi Kite, *Ictinia misisipensis* (Wilson), occurs in at least thirteen counties in the Panhandle. This species nests in wooded river bottoms and seldom ranges more than a half mile from its nest. The bulk of the population arrives in May. Fall migration occurs from mid-August to the latter part of September.

39. Some Recent Bird Records from Canada's Eastern Arctic. T. M. Shortt and H. S. Peters. 1942. *Canadian Journal of Research*: 338–348. This is an annotated list of birds observed on two voyages of the "Nascopie" (1938 and 1939). There are notes on numbers, distribution, habitats, etc., for 82 species. It should be a valuable source of information for this region.

40. The Noisy Scrub-bird (*Atrichornis clamosus*). Major H. M. Whittell. 1943. The *Emu*, 42: 217–234. The Noisy Scrub-Bird before its extinction had a limited local distribution in the coastal districts of southern Western Australia with the greatest numbers of records from the region of King George's Sound where it was last seen in 1889. The author suggests that human interference does not account completely for its disappearance. Most of the paper is devoted to a listing and discussion of the existing skins of this species.

BOOKS

41. The Life of the Robin. David Lack. 1943. London. H. F. & G. Witherby. 200 pp. 7/6. In this engaging little book the author has succeeded admirably in giving the modern outlook on the biology of birds with *Erithacus rubecula* as the chief example. In non-technical language, enlivened by quotations from folk-lore and poetry, and with references unobtrusively consigned to a special index, he gives us the results of four years of banding (119 adults and 121 nestlings), of breeding Robins in aviaries, and of experiments with mounts. An excellent feature lies in the numerous analogies between bird and human behavior, as the threat value of a red sweater on Tibetan tribesmen, intimidation of Crusaders by the singing of Hussites, courtship feeding, childishness of some human invalids, shifting of territorial boundaries through vocal encounters as in Munich 1938. Although the life of the Robin is "devoted almost exclusively to fighting," it "is so inhuman as to achieve its victories without bloodshed," p. 5.

Two interesting points are made in the introduction: "First, though in birds

the main patterns of behaviour are the same for all the members of one species or sub-species, individual differences exist and are by no means negligible. Secondly, birds act much more quickly than human beings, and it is often difficult to see the whole of what takes place."

The Robin is one of the most territorial of birds, holding territory throughout the year except during the molt, while females hold territory alone in the fall. Its chief occupations are singing and fighting, although most of the fighting is bluff-intimidation of the intruder by prominent display of the red breast. As to singing, the popular theory is that birds sing "because they are happy. From which it could be concluded that whereas cock robins are happy most of the year the hens are happy only in autumn, that cock robins are happier before than after obtaining mates, and that they are happiest of all when fighting," p. 26. As to the red breast, "When a bird possesses a bright patch of colour, one may guess that it plays a part in its life sufficiently important to outweigh the disadvantages of added conspicuousness to enemies," pp. 37–38. "Like song, but coming into operation at close quarters," the function of the threat display "is to save actual fighting," p. 38.

In the chapter on "The Significance of Territory," two classical writers are quoted: Aristotle in the 4th century B.C. who mentioned spacing because of food requirements with eagles and ravens, and Zenodotus in the next century who said "One bush does not shelter two robins." Mr. Lack gives evidence against the food value theory and "optimum spacing"; he believes that if double the normal number of Robins were available in an area, the territories would be halved in size. With an over-population of Song Sparrows in 1932 I found territories as large as in preceding years with smaller populations: a few of the banded males were crowded out of their territories into unfavorable positions and soon disappeared. The author does not give as clear a statement of what he considers the function of territory as might be desired. A telling summing up of the territorial situation is given: "Victory, in fact, goes not to the strong but to the righteous, the righteous, of course, being the owner of the property," p. 46.

One new item concerns the technique of pair formation. With the Robin the main factor involved seems to be "that the hen in search of a mate persistently flies right up to the cock and does not retreat when he postures, whereas intruding robins normally avoid the owning cock and leave the territory when attacked," p. 64. This agrees with behavior in many other birds as well as in some fishes and the cuttlefish.

Space forbids mentioning more than a fraction of the interesting observations given. Of the 121 nestlings ringed, 13 settled down near their birthplaces. In an important chapter on "Age," calculations are made from banding returns as to life expectancy in this species: 62 per cent of the adults die each year; a fledgling just leaving the nest has an expectancy of 10.8 months; an adult on August 1st 13.3 months. An 11 year old hen Robin was found by J. P. Burkitt (1938)[1] in Ireland; a ten year old bird was taken on Heligoland.

The final chapter is a "Digression upon Instinct"; here various definitions are discussed and found wanting. "The term instinct should be abandoned," p. 177, but we are not told what we are to use instead.

There are indices of species (common names only) and of persons mentioned; instead of a subject index topics discussed in each chapter are given in the table of contents. This is a book that can be highly recommended to the general reader, to all people interested in birds and to the serious student.—MARGARET M. NICE.

42. Dream Island Days. R. M. Lockley. 1943. Witherby, London 144 pp. 10/6. The author's *Shearwaters* (1942) has established his authority on

[1]Eleven-year-old Robin. *Irish Nat. Journ.*, 7: 85.

the breeding habits of the Manx Shearwater, *Puffinus puffinus puffinus* (Brünnich). In *Dream Island Days* he describes his life and adventures on the lonely island of Skokholm where he and Mrs. Lockley lived for thirteen years and where his remarkable studies of shearwaters were made. This book is an interesting popular account which provides the background to the author's scientific studies. Although primarily non-scientific there is a chapter on the breeding habits of the Manx Shearwater as well as notes on other species. There are lists of birds (without scientific names) recorded on Skokholm, 1927–1940. There is also a list of plants (with scientific names). The attractive illustrations consist of plates from photographs and sketches by Mrs. Lockley.

43. Criteria for Vertebrate Subspecies, Species and Genera. Charles M. Bogert, W. Frank Blair, Emmet Reid Dunn, E. Raymond Hall, Carl L. Hubbs, Ernst Mayr, and George Gaylord Simpson. 1943. Annals of the New York Academy of Sciences, 14, Art. 2: 105–188. This is a series of papers presented at a joint symposium of the American Society of Ichthyologists and Herpetologists and the American Society of Mammalogists, April 3, 1942. Each of the papers presents an interesting summary of concepts of subspecies, species, and genus as they are applied to that particular class of vertebrates. Collectively they show the tremendous diversity of taxonomic criteria employed in the various classes. The papers are well done and the entire collection is recommended as an excellent cross section of contemporary taxonomic thought especially for vertebrate zoologists not engaged primarily in taxonomic work.

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